



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

NYPL RESEARCH LIBRARIES



3 3433 06633571 6



American  
3-VDG





American  
3-106



PROCEEDINGS  
OF THE  
THIRD  
AMERICAN ROAD CONGRESS

UNDER AUSPICES OF  
AMERICAN HIGHWAY ASSOCIATION  
AMERICAN AUTOMOBILE ASSOCIATION



Price \$1.00 postpaid

DETROIT, MICH.  
SEPTEMBER 29-OCTOBER 1, 1913

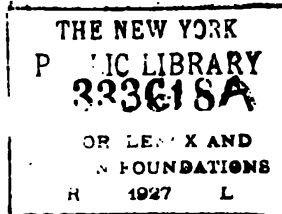


## j.

**AMERICAN HIGHWAY ASSOCIATION**  
**AMERICAN AUTOMOBILE ASSOCIATION**

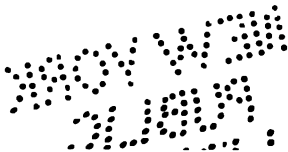


11.



COPYRIGHT 1914  
BY  
AMERICAN HIGHWAY ASSOCIATION

COMPOSED AND PRINTED AT THE  
WAVERLY PRESS  
BY THE WILLIAMS & WILKINS COMPANY  
BALTIMORE, U. S. A.



Proceedings of  
**THIRD AMERICAN ROAD CONGRESS**  
UNDER AUSPICES OF  
**AMERICAN HIGHWAY ASSOCIATION**  
**AMERICAN AUTOMOBILE ASSOCIATION**

**OFFICERS**

**L. W. PAGE, *President***  
**Director, United States Office of Public Roads**  
**J. E. PENNYBACKER, *Secretary***  
**Secretary, American Highway Association**  
**LEE McCLUNG, *Treasurer***  
**Former Treasurer of the United States**  
**CHARLES P. LIGHT, *Assistant to President***  
**Field Secretary, American Highway Association**

**Executive Committee**

**GEO. C. DIEHL, *Chairman*, Good Roads Board, American Automobile Assn.**  
**L. W. PAGE, *President*, American Highway Association.**  
**W. T. BEATTY, *President*, National Association of Road Material and Machinery Manufacturers**



**AMERICAN HIGHWAY ASSOCIATION**

**COLORADO BUILDING.**

**Washington, D. C.**

MR. L. W. PAGE, *President*, Director, U. S. Office of Public Roads  
MR. W. W. FINLEY, *Vice-President*, President, Southern Railway Co.  
MR. J. E. PENNYBACKER, JR., *Secretary*  
MR. LEE McCUNG, *Treasurer*, Former Treasurer of the United States  
MR. CHARLES P. LIGHT, *Field Secretary*

## Board of Directors

MR. JAMES S. HARLAN, *Chairman*, Member Interstate Commerce Commission  
MR. L. W. PAGE, Director, United States Office of Public Roads  
MR. JAMES H. MACDONALD, former State Highway Commissioner of Connecticut  
MR. W. W. FINLEY, President, Southern Railway Company  
MR. L. E. JOHNSON, President, Norfolk & Western Railway Company  
MR. LEE MCCLUNG, Former Treasurer of the United States  
MR. ALFRED NOBLE, Past President, American Society of Civil Engineers  
MR. B. F. YOAKUM, Chairman, Frisco Lines  
MR. ARCHIBALD H. HUSTON, of Columbus, Ohio  
DR. WALTER H. PAGE, Ambassador to Great Britain  
MR. W. T. BRATTY, President, National Association of Road Machinery and Material Manufacturers  
MR. LEONARD TUFTS, President, Capital Highway Association  
DR. JOSEPH HYDE PRATT, State Geologist of North Carolina  
MR. A. G. BATCHELDER, Chairman, Executive Committee, American Automobile Association  
MR. CLARENCE A. KENYON, President, Indiana Good Roads Association  
MR. JOHN M. GOODSELL, of New York  
MR. GEORGE C. DIEHL, Chairman, Good Roads Board, American Automobile Association  
MR. THOMAS G. NORRIS, President, Arizona Good Roads Association  
MR. GEORGE W. COOLEY, State Highway Engineer, of Minnesota  
MR. JESSE TAYLOR, Editor, Better Roads  
MR. LEWIS W. PARKER, President, South Carolina Cotton Manufacturers Association  
MR. BRYAN LATHROP, Member Lincoln Park Commission, Chicago  
MR. JOSEPH W. JONES, of New York City  
MR. A. G. SPALDING, Member, San Diego Highway Commission  
MR. PHILLIP A. COLGROVE, President, Michigan Good Roads Association

## Executive Committee

MR. W. W. FINLEY, *Chairman* MR. L. W. PAGE  
MR. ALFRED NOBLE MR. GEORGE C. DIEHL  
MR. B. F. YOAKUM

**AMERICAN AUTOMOBILE ASSOCIATION**

**437 FIFTH AVENUE.**

## New York City

MR. JOHN A. WILSON, President, Franklin, Pennsylvania  
MR. H. A. BONNELL, Treasurer, East Orange, New Jersey  
MR. JOHN N. BROOKS, Secretary, Torrington, Connecticut  
MR. A. G. BATCHELDER, Chairman, Executive Committee  
MR. GEORGE C. DIEHL, Chairman, Good Roads Board

## CONTENTS

Officers and Directors.....	4
Address of Welcome.....	8
Address of Hon. Logan Waller Page.....	11
Address of A. G. Batchelder.....	14
Address of Col. Wm. Washington.....	17
General Session.....	22
Address of Hon. David F. Houston.....	22
Address of Hon. A. W. Campbell.....	28
Lessons Learned at the Recent International Road Congress in London and Observations on French and English Road Systems.....	32
Address of James H. MacDonald.....	43
The Missouri Plan.....	49
Committee on Resolutions.....	53
Federal Legislation Session.....	55
Federal Road Legislation.....	56
Address of Edward H. Butler.....	65
Address of Hon. Wm. P. Borland.....	71
Address of Charles T. Terry.....	80
Road Legislation and Administration Session.....	84
The Merit System in Road Management.....	84
A Plan for Simplifying Road Legislation in the States.....	91
Address of Archibald H. Huston.....	94
Address of Charles T. Terry.....	95
Address of Clarence A. Kenyon.....	97
Construction and Maintenance Session.....	102
Unsurfaced Roads.....	102
Gravel Roads, Their Construction, Maintenance, Cost and Special Treat- ment.....	112
The Sand-Clay Roads Maintenance in North and South Carolina.....	126
The Treatment of Wornout and Ravelled Macadam Surfaces.....	129
Development and Maintenance of Highways in Allegheny County, Penn- sylvania.....	137
Bituminous Construction.....	143
Waterway Structures.....	151
Brick Road Construction.....	157
The Selection of Materials for Macadam Roads.....	170
Address of Judge Joseph Asher.....	175
Contract Session.....	178
Legal Suggestions Respecting Road Contracts.....	178
Municipal Contract Law as Applied to Road Construction.....	189
The Protection and Upkeep of Road Equipment.....	194
Finance Session.....	199
Financing Road Improvement.....	199
Bond Issues for Road Improvement.....	202
Highway Accounting with Special Reference to Maintenance.....	211
Economics Session.....	217
Systematizing the Purchase of Road Materials and Equipment.....	219
The Labor Problem in Road Construction.....	225
Louisiana Highways.....	228
California's \$18,000,000 State Highway System.....	238
Dirt Roads and Politics.....	244
Road Users' Session.....	249
Address of C. A. Magrath.....	249
Address of A. W. Campbell.....	250

Address of John N. Carlisle.....	252
National Old Trail Roads.....	258
The Farmer and the Road.....	263
Address of Col. Sidney Suggs.....	269
Address of Col. Wm. D. Sohler.....	276
Address of George A. Ricker.....	281
National Roads.....	285
Resolutions Adopted.....	293
Michigan Day.....	295
Concrete Roads.....	295
American Road Congress.....	309
Meeting of American Highway Association.....	310

# THIRD AMERICAN ROAD CONGRESS

Held Under the Auspices of

AMERICAN HIGHWAY ASSOCIATION

AMERICAN AUTOMOBILE ASSOCIATION

MICHIGAN STATE GOOD ROADS ASSOCIATION

Detroit, Michigan, September 29, 1913.

President L. W. Page in the Chair.

THE CHAIRMAN: The Convention will please come to order. The Congress will open with an invocation by the Rev. Dr. Joseph A. Vance, pastor of the First Presbyterian Church.

DR. VANCE: Let us unite in prayer. Almighty God, our Heavenly Father, we invoke Thy divine blessing upon this gathering of men and upon all the deliberations in which they will be engaged, and upon all the issues that shall flow from this convention. Give to them, we pray Thee, great fidelity in the discharge of every duty, a broad vision of the purposes of the Almighty, a great desire to make this earth a better place in which to live while they dwell upon it, and a great joy in the fellowship, in the work of honest men. Bless, we pray Thee, the messages that shall be brought to these gatherings from day to day; may they be spoken with clear vision, with warm heart, with an aspiration for the common weal. Give to the men who gather here and sit in these seats from day to day, a great desire not only to know what will contribute to the welfare of humanity, but that they may give themselves to its realization. We bless Thee for the good roads movements of history. We thank Thee for every man that has tried to fill up a low place and make it level and dig down a rough place and make it smooth and tunnel through mountains of difficulty and fill up bogs and morasses, that the crooked places may be made straight and the rough places smooth and a highway be built on which men may travel with ease and comfort and reach their destination. We pray Thee that this movement may sweep over our nation and that narrow-minded prejudices give way as it advances; that the close-fisted man who wastes his money in multitudes because he is not willing to spend it in little, will be converted and see a better way, and that through it all we may not only move commerce and economize power and bring in added comfort and bring the producer closer to his market, but we pray Thee that, above all, we may learn to build honest roads that will wear for centuries and put in honest stuff, and put into

every road we build every cent of money that the people have given us with which to build it. Give us honesty in executing our trust, as well as a vision of the great possibilities before us. Have in Thy loving care, we pray Thee, our families from whom we are separated. Keep our wives and children safe from harm and bring us safely together again in Thy good time. Pour out Thy spirit, we pray Thee, upon all who are moving for the advancement of human progress and hasten the time when that Highway, which shall be called the Way of Holiness, shall be along every road that men build and nothing unclean shall pass over it. We ask this for the glory of Thy Name, forever and ever. Amen.

THE CHAIRMAN: In the absence of the mayor of Detroit, I have the honor to introduce Mr. Charles B. Warren, who will deliver an address of welcome from the business men of Detroit.

### ADDRESS OF WELCOME

BY CHARLES B. WARREN

It affords me, in behalf of the business and professional men united in the Board of Commerce of this city, very great pleasure to bid welcome to this third annual meeting of the American Road Congress. Detroit welcomes the opportunity to have the sessions of these delegates held in our city, because it is interested, as, of course, every group of sane individuals is interested, in good roads.

The problems which you have to solve are really problems of great national importance. The organization, I take it, is for the purpose of preaching the gospel of good roads and studying the economics of road building. It is of primary importance, at this period in the development of the civilization of this great country, that the roads as highways of commerce should be improved and improved speedily and in a lasting and economical manner. The matters you have under consideration go to one of the vital problems of the day, because the burden laid upon the people by reason of the increased cost of transportation enters into the present high cost of living. When we realize that in the older countries, where the construction of the highways preceded the building of the railroads; when we realize, I say, that in the older countries the farmer transports a load for from one-tenth to one-half the cost that the farmer pays in our country, we realize what a vast burden is laid upon our people in unnecessary transportation cost.

When this country was new, it was of first importance that the railroads should connect up the various sections of our great territory. That task has, in a measure, been completed, and it is now of vital interest to all the people that this great organization should give serious consideration to the building of adequate highways, and send out a message to the people that will assist in the matter of the economic building of good roads.



But Detroit is interested in your deliberations for another reason. Her progress and development is now largely bound up in the prosperity of the motor car industry, and these two—good highways and good motor cars—move along side by side. This production in such great numbers of individual power plants which can be used by one person for the purpose of individual transportation and the transportation of the individuals' freight, as against the use of the common system—that is railroad or vessel transportation—is a matter of world importance.

Detroit welcomes to the city your guests of honor, who will be here during this meeting, and especially the member of the President's official family. We hope that through these meetings and through the message that may be delivered to you by the representative of the administration, that some method may be found by which the hand of the federal government may reach out and assist in this great project of good roads.

And Detroit is interested in this other movement—in the Lincoln Memorial Highway. It appeals to our imagination, this idea of a connected, improved highway from the Atlantic to the Pacific, binding many States of the Union closer together. It appeals to our sense of patriotism that this highway should be known as the "Lincoln Highway," for the spirit and the blessed memory of that man binds this Country together as the spirit and memory of no other American who ever lived.

In behalf of the city and in behalf of the business and professional interests of the city I again bid you welcome and trust that you will enjoy your stay with us as much as we will enjoy participating in your deliberations.

THE CHAIRMAN: I have a letter here, which I will read to the Congress.

The Chairman then read a letter from President Wilson, after which Mr. Diehl read letters from the attorney-general of the United States, the secretary of the navy and the secretary of the treasury.

[COPY]

THE WHITE HOUSE,  
Washington.

September 10, 1913.

*My dear Mr. Page:*

May I not convey, through you, to the members of the American Road Congress, which is to assemble in Detroit, my sincere regret that I cannot be present and express, at least, the very deep interest which I feel in the whole matter of adequate road building in the United States. Every man who wishes to see this great country made the most of must sympathize with the efforts now being made to weave its parts together by good roads.

Please present my cordial greetings to the congress.

Sincerely yours,

WOODROW WILSON.

Mr. Logan Waller Page, Pres.,  
American Road Congress,  
Washington, D. C.

## AMERICAN ROAD CONGRESS

OFFICE OF THE ATTORNEY GENERAL,  
WASHINGTON, D. C.

September 17, 1913.

L. W. PAGE, Esq.,  
President, Third American Road Congress,  
Colorado Building,  
Washington, D. C.

*My dear Sir:*

Permit me to acknowledge receipt of your kind invitation of September 16th, to attend and take part in the sessions of the American Road Congress, to be held at Detroit, Michigan, September 29th to October 4th, and to thank you for the same.

It is impossible for me to anticipate so far in advance my official engagements during the days set for the sessions of the Congress. It will give me pleasure to attend if possible.

I accept this opportunity to say that I am heartily in sympathy with the desire which seems general among our people to secure better roads, and think that the welfare of the nation will be subserved by the success of the movement in that direction, which has already obtained considerable momentum, provided it is restricted within proper lines.

In the event I am unable to be present in person, you are at liberty to use my expressions of endorsement as you think best.

Very truly yours,

J. C. McREYNOLD,  
Attorney-General.

THE SECRETARY OF THE NAVY,  
WASHINGTON.

September 23, 1913.

*My dear Sir:*

It was very kind of you to invite me to participate in the Third American Road Congress which will convene at Detroit on the 29th instant. As one sincerely interested in good roads, I should take keen delight in attending this conference and I wish it were possible. Unfortunately conditions are such that I cannot make the trip and I pray that I be excused. I wish to add, however, assurances of my best wishes for the further success of the great work in which you are engaged.

Cordially yours,

JOSEPHUS DANIELS.

L. W. PAGE, Esq.,  
President, American Road Congress,  
Colorado Building,  
Washington, D. C.

THE SECRETARY OF THE TREASURY,  
WASHINGTON.

September 17, 1913.

*My dear Mr. Page:*

I have your favor of the 16th instant, inviting me to attend and take part in the sessions of the American Road Congress in Detroit on September 29th, and regret very much that on account of the pressure of official business I am unable to be present.

With kind regards, I am,

Sincerely yours,

W. G. McADOO,

L. W. PAGE, Esq.,  
President, American Road Congress,  
Colorado Building,  
Washington, D. C.

THE CHAIRMAN: Gentlemen, I am next on the program, but am suffering from such a severe cold that my voice will not permit me to make the remarks I desire to make, so Mr. Colgrove, president of the Michigan State Good Roads Association, has kindly consented to read what I wanted personally to say to you.

### ADDRESS OF HON. LOGAN WALLER PAGE

#### *President of the American Road Congress*

In a city which, not content with paralleling the best achievements of American genius and industry, amazes the world year after year by surpassing the records of the preceding year, the American Road Congress has chosen to hold this great meeting, which, I firmly believe, will mark an epoch in the movement for better roads throughout the United States and Canada. The welcome which the city of Detroit and the State of Michigan have given us is worthy of the finest traditions of American hospitality, and I am merely voicing the sentiment of the thousands of my colleagues who have come from every quarter of this continent, when I say, "We are glad to be here."

A mighty wave of sentiment for better roads is sweeping over the country, and already the American people have entered upon a road-building era which has no parallel in all history—not even the splendid era when Rome knit together, with massive military roads, the far-flung outposts of her empire, nor the century of constructive work begun by Napoleon, which has given to France the most superb system of highways in the world. Last year more than two hundred million dollars went into the building of roads, and, in a small measure, to their maintenance. Eight years ago the total expenditure was only about eighty millions of dollars, so that we have more than doubled our outlay for roads in this brief period. Not alone in money is this great movement measured, but in progressive and effective state legislation for road betterment. Nearly all the States have established departments of highways, have provided for State participation in the building and care of the highways, and have, in some cases, undertaken comprehensive educational and investigative work, which must result in improved methods and better management. More important, more far-reaching, more vital in its effect upon the nation, as a whole, than other developments in this great onward movement, is the fact that we stand today upon the threshold of a policy of federal aid to road improvement.

For more than a century our ablest statesmen have differed among themselves on the question of Federal participation in the improvement of the public roads. The era of national road building begun in the early days of the republic and ending about 1840, was due to conditions which were not analagous to those which exist today. The western country was filling up with American pioneers, while the great range of the Allegheny Mountains formed a barrier which seri-



ously interfered with traffic and communication between the east and west. The old plan of local assessment for the building of roads could not meet this condition, as the great expanse of country through which the roads must pass was unbroken wilderness. Only a powerful agency, such as the national government, was able to undertake and carry through the project, and thus resulted the first national road, generally known as the "Old Cumberland Road."

Today, conditions exist which, although totally dissimilar to those I have just mentioned, are a justification for extraordinary measures in providing adequate highway facilities. The rapid introduction of the automobile into every section of the country has revolutionized traffic conditions. Villages and towns and cities that were remote from each other twenty years ago, are now, so to speak, on visiting terms. The automobile has brought people close together. The electric railway lines have spread a fringe of suburban dwellers over a radius of many miles about our great cities. The concentration of population in manufacturing and traffic centers has made necessary the transportation of huge quantities of food from the producer to the consumer, and the transportation of immense quantities of manufactured products back to the farm dweller from the city factories. The vacation-loving American has made possible the opening up of summer and winter resorts, and has made accessible the splendid scenery of our continent.

The cumulative result of all these individual forces has been the weaving of a web of interdependence, which reaches every city and every town and every farmhouse. We no longer live for ourselves, but for each other. The country road a thousand miles away from New York City is part and parcel of the life of New York City. In other words, the public highway is no longer a mere local utility. It is a national asset, a national liability, a national responsibility, and the Congress of the United States has come to a realization of this fact to such an extent that the day of federal aid to road construction is at hand. It is the duty of every patriotic American citizen to look upon this question seriously and unselfishly and to aid Congress in the fullest measure, to the end that an equitable and practical law may be enacted. There is opportunity for the parceling out of federal appropriations for political ends, such as would grow into a scandal and disgrace to the nation and be an impediment to the road movement, which would set it back for a century. There is opportunity to turn this great movement into political channels, which would make the aid of the government a farce and seriously endanger the institutions of our government. Think carefully before you give your support to any measure which is branded with the stigma of political expediency.

It seems that carefully-prepared statistics show an outstanding bonded indebtedness of townships, counties and States for road improvement amounting to something over four hundred million dollars. I have heard expressions of alarm at the magnitude of our expenditures. I do not consider that the amount of money we are spending

for roads is in the slightest degree a cause for worry. Our chief concern should be to properly safeguard the expenditure and see that we get results commensurate with the outlay and that the utility which is thus created is so cared for that it loses none of its value to the community, the county, the State, or the Nation. I am informed that last year the people of the United States spent three hundred and sixteen million dollars to see moving pictures. The moving-picture industry is a new one. The inclination for this form of diversion is, therefore, a recent acquirement, so that we have the spectacle of the American people suddenly spending for the gratification of a whim an amount very little less than our total indebtedness for good roads throughout the entire country—an amount sixty per cent greater than the annual outlay throughout the entire land for road improvement and maintenance. If the people of the United States can spend this great sum of money without affecting in the slightest degree their prosperity or comfort, it is idle to talk of even five hundred million dollars a year as a burden too great to be borne.

In my judgment, we cannot too strongly condemn the haphazard issuance of long-term bonds for the building of roads for which no adequate maintenance provision is made, or for the building of roads which are located without reference to the needs of the locality or of the State, and which may begin nowhere and end nowhere, or for the building of types of roads, the cost of which is out of all proportion to the requirements of the community, either from the extreme of expensiveness or the extreme of cheapness, or the building of roads on a large scale without adequate administrative organization, without proper safeguarding of revenues.

Every bond issue should be based upon the most thorough investigation of the needs of traffic, the financial, the State, or local unit, and the types of road and the conduct of the work should be based upon the soundest engineering principles and practice. Above all, there should be clear-cut, effective legislation, adequate appropriation, and efficient organization to insure the most nearly perfect maintenance of the roads built with the proceeds of a bond issue. The bonds should not outlive the road. It is almost criminal to issue fifty-year bonds for a road that is worn out in five years.

There are thousands of antiquated, conflicting, and wholly superfluous laws on the statute books of the various States bearing upon the public roads. It has long been a practice of new members of State legislatures to introduce road bills when they could think of nothing else upon which to expend their activity. The time has come when there should be a concerted movement throughout the whole country to eliminate from our statute books this mass of useless legislation and start anew with clean-cut, concise and effective legislation.

Finally, I wish to express the hope that the American Road Congress may become more and more an annual clearing-house, where the best thought and practice of good roads people throughout the United States and Canada may be exchanged, and started on an



endless chain—so to speak—so that we may all benefit by the progress that each is making, and by avoiding the duplication of effort, so that the costly mistakes which have marked our course in road matters for over a century may not be made again and again. I believe this annual congress is of great benefit to the engineers, contractors, legislators, manufacturers, and finally, the taxpayers, and I look forward to the day when it will be so well established, so firm in the regard of the people, as to be one of our national institutions.

**THE CHAIRMAN:** The next speaker on our program is Mr. Enos, president of the American Automobile Association, but he has been detained and will not be able to get here until tomorrow, so I shall ask Mr. A. G. Batchelder, chairman of the Executive Board of the American Automobile Association, to give us a talk.

### ADDRESS BY A. G. BATCHELDER

#### *Chairman Executive Board of American Automobile Association*

This abrupt injection of me into these proceedings reminds me somewhat of the story of an Irishman by the name of O'Brien. It seems that O'Brien, as a contractor, had prospered exceedingly, and in due course of time he moved from a ward down on the river front up into the avenue of the town, and thought that he was going to comfortably settle down. But his two daughters had several years in a boarding school, and when they came back they flatly refused to let O'Brien continue to smoke his pipe in the parlor as he had done in the little house down by the river. So he was relegated to the rear steps. Finally one day O'Brien died, and he was laid out in the parlor. Mrs. Murphy came up from the river district, and standing beside the remains of O'Brien tearfully commented: "O'Brien, you beat them at last; you got into the parlor." Now, Mr. Enos is not dead; he simply could not be here to-day. I am one that the A. A. A. sends into the country to talk roads. Many of you who are here present have had to listen to me out in the West and in North Carolina and in other States, and so I am going to be very brief this morning.

We automobilists, once upon a time, used to half apologize for our participation in this road question until finally we awakened to the fact that we were the men who were using the roads more than anyone else. Of course it was charged that we were wearing out the roads, which, at that time, was undoubtedly true. So we said that if we use the road more than anyone else and if we wear out the roads, it is up to us to get into this road movement good and hard with our work and energy; and, furthermore, as long as we are paying a road tax to use the roads, we might as well wade in and swim in the open and struggle along with the rest of the people. We have also hugged the delusion, that ultimately, most road users were going to be of

the motor driven variety, simply because it was a matter of economics; in other words, if you could in any way save time or save in the cost of transportation, why wouldn't it be simply a matter of cause and effect that the people would, in many instances and wherever they could, become users of motor-driven vehicles. So we find ourselves today mixed up in this movement more and more, and we do not apologize like we used to do. All we can say is that we are trying to do our share of the work, and because we do our share of the work we want you to know this, that we are not interested in the making or selling of any particular automobiles; we simply say that a motor-driven vehicle is an economical vehicle today and we believe most of you are going to use them.

Not long since, I was out in the West, and during the course of a meeting there came up the question of a State highway commission. One man got up and said: "I object to this idea of a State highway commission; do you know that means that some State officer can come into our county and tell us what kind of a road we should put down and how we shall maintain it? I consider that an invasion of county rights." Now, someone did happen to think to ask him what his occupation was, and he rather reluctantly said that he was a county commissioner. Do not misunderstand me. I believe there are many mighty good county commissioners who have done a vast amount of work, and we are going to have many more.

I think that the average man is willing that the State shall relieve the counties of roads that are really interstate in their use, and we simply advance another point when we say that the States themselves are going to look to the general government for a certain amount of coöperation and support in those roads that go from State to State.

I do not know why many of us, interested in this road question, should talk to others equally interested and attempt to convince them, when it is not any longer necessary. You may recollect the story of the parson who when he was baptising a rather belated and elderly convert in the river was interrupted by a man from the shore exclaiming: "Excuse me, parson; I don't mean to interfere with your business, but that old sinner, if you will stake him in the river over night, it will be a much better job." I don't believe that any of you have to have forced upon you the good roads talk, as far as the general proposition is concerned. Later, we will hear a great deal from men who are expert in the construction of roads, men who are interested in matters of finance and other phases of the subject. Hence it would be unfair for me to give you any of that talk now. This convention is going to be the most successful we have ever had in the country. Mr. Page said: "This is a kind of a clearing house," and it is going to meet the needs of the situation better than anything else that has heretofore existed, and when we can get the representatives of our national government to participate with us on this occasion, there cannot be any other than a mighty good result. Thank you.



The Chairman called upon Judge J. M. Lowe, President of the National Old Trails Association, for a few remarks.

Judge Lowe then gave a complete history of the Old Trails Association. He stated that the Old Trails Association was organized for the purpose of illustrating the whole mighty movement toward a magnificent general system of national highways. He called attention to the fact that as early as 1802 it became a serious question whether the government, which had just been organized, should subsist or not; that the Aaron Burr conspiracy which sought to build up a mighty empire in the great southwest, was threatening the dissolution of the Union; that at such a crisis the prolific brain of Albert Gallatin conceived the idea of building a great national highway which would cement the States of the west with the States of the east and thus preserve the American union. The matter was referred to a committee of Congress, upon whose recommendation the bill was passed. In 1802 the first State to be admitted to the Union was the State of Ohio and it was written into the contract of union between Ohio and the other States that 5 per cent—one-twentieth of the public lands situated in the State of Ohio should be appropriated for the building of a road to and through that State. The other States, in forming a Union, had retained their public land and disposed of them as they saw fit, appropriating the proceeds to their own use. No such right was accorded to the State of Ohio and for thirteen years the proceeds of the public lands situated in Ohio were appropriated to building of roads through the States of Maryland, Pennsylvania, and Virginia, and stopping at the western line of Virginia; thus a road, pronounced by Mr. Clay to be superior to the great Appian Way was built over which the mails were carried and over which carriages could be driven at the rate of 80 miles a day. Indiana was then admitted into the Union with precisely the same provision in its contract; Wisconsin was admitted with an amendment appropriating each alternate section in the State of Illinois for the building of public highways. Missouri came into the Union and the same compact was made with her. The result was that the old road was carried through the State of Ohio and some splendid work done there; a trace of it was made through Indiana, and it was not much better than a trace, and not even a trace all the way through Illinois, but at Vandalia, the then capital, the last work accomplished on this old road was done on an old culvert just outside of Vandalia, and there it stopped 150 miles or 200 miles from the eastern line of Missouri. The work in the east went on until 1837.

Judge Lowe, in a very forceful manner, viewing the matter from a constitutional standpoint, drew attention to the parallel question of appropriating enormous tracts of land, larger than the entire area of Michigan and Wisconsin for the purpose of securing a railroad to the western coast, and also the appropriation of \$400,000,000 for the building of the Panama Canal, the latter he characterized as "a magnificent enterprise, a splendid, great public work, and I am glad we did it."

He then made a stirring plea for the building of great national highways by the federal government. He said, however, that he was not absolutely committed to this plan and might be converted to the plan providing that the State, county and township, should contribute an equal amount, dollar for dollar, with the government. His reason for opposing the latter plan was the idea of retaxing the people before they would be permitted to have the benefit of the money that they had already been taxed for, contending that they should be appropriated at first hand by the federal government for the best interests of the people, the more important of which he believed to be the building of good roads.

Judge Lowe further said, "I cannot for the life of me conceive of any great difference in taking the money to build roads out of the national treasury, or out of the State treasury, or out of the county treasury, except that Uncle Sam's pocket is the deepest and biggest and the government has power of taxation that the States and counties have not. He can replete his pocketbook very readily, the State cannot, neither can the county. Now that's the biggest pocketbook and this is our money, all the time, and I am in favor of building roads out of it. . . . If anything is written in the Book of Fate more clearly than any other it is that this government has now reached a point where it is going to take a hand and a large hand in building a system of national highways. It is sure to win, and in my judgment, to win during the life time of the next Congress, not next year, not the year after, not after we old gray-haired fellows have gotten off the stage forever, but it is going to happen in my lifetime and in yours, and we will ride in our splendid automobiles, and will travel around all over this country over a splendid system of national highways."

THE CHAIRMAN: I have the pleasure of introducing Col. Wm. de H. Washington.

#### ADDRESS BY COL. WM. de H. WASHINGTON

*Member of the Board of Consulting Engineers of the State of New York*

Mr. Chairman and Gentlemen: I was about to say "Ladies and Gentlemen," but if I were in Kentucky I would consider that latter expression was entirely unnecessary, for I understand that in Kentucky gentlemen always embrace the ladies. So I will only say "gentlemen" and leave it to the gentlemen to embrace the ladies.

I come before you totally unprepared. It takes me fully two weeks to properly consider and get together a real impromptu address, therefore you will have to take just what comes to me as I think upon my feet.

I have not been assigned any topic or text, so shall have to make up my text as I go along. In this state of unpreparedness, I feel very much like the organist in Leadville in the early days of that camp, who used to play the organ in the gallery.

The miners would sometimes get a little too much tarantula aboard, and they'd come to church on Sunday, more out of curiosity than otherwise, and would have a little playful pistol practice at the organist. Finally he had a placard painted which hung over the dash board of the organ top—with this legend upon it: "Don't shoot at the organist; he is doing the best he can." If you will permit me, under these conditions, I will endeavor to say a word or two to you.

It is a wonderful thing to think that where we sit at this moment, a little more than a century ago was but a mere trading-post in the far west. There was not a road or highway within 500 miles of this city.

Our whole western territory at that time was inhabited largely by red men and wild animals, and our progress has all been since then, in fact, I have a map of the roads of the nation a century and a half ago and practically all the then interior highways are marked as warpaths or trails.

In the days of Benjamin Franklin, who was the first postmaster of the United States, he visited every postoffice in the United States and it was not a very difficult job, for at that time they numbered twenty-seven.

We had thirteen States and that was a little more than two to a State. Massachusetts had eight, which was a good deal more than her share, and I believe North Carolina had only one; so you can understand that our development of roads has been quite remarkable, after all, because we had absolutely none when other nations were very well provided.

It has been said that a man is only so old or so young as his arteries. It is equally true, that a nation is also only so old, so young, or so prosperous, as its arteries. Our roads, after all, are the arteries of the nation and the means by which and over which its commerce flows.

We have got to modernize and improve and make young our national arteries, because many of them have fallen into a very sad condition and are very old and decrepit from the standpoint of efficiency.

Time was when the value of land depended upon the distance from the railroad or the market or the means of water traffic, such as our rivers and our great lakes, in the earlier days.

These splendid machines, the automobiles, that are made in this City by the Straits have made the farm that formerly was 15 or 20 miles from a railroad of an almost nominal value, have brought it relatively within 3 or 4 miles or possibly within 2 miles of the station, so far as time and expense are concerned.

If you give the man or farmer a good road to do his work and to get his crops over you have done him the greatest service.

I am not going to give you a dissertation upon good roads and their necessity, but I am going to say just a word to you, perhaps, that will be a little more pertinent than interesting.



I have just come from another road congress, the Third International Road Congress, held two months ago in London, and it was a most remarkable gathering. Thirty-nine nations were represented by between 2500 and 3000 delegates.

It was a gathering that, from the standpoint of language I think would almost put the famed story of the Tower of Babel to shame. All its proceedings were conducted in three languages, but there were gathered together at that time the enthusiasts and road builders of the principal nations of the world.

I want to say in this distinguished presence that it is a disgrace to our nation that the United States was one and the only nation that was not officially represented, because we have passed a law in Congress that the President of the United States cannot appoint a delegate to any international congress without a special act of Congress, I was almost ashamed to be there as an American and find delegates from Siam and from the Strait Settlements, from Jamaica, Asia Minor, South American countries, and I think there was one there from Baluchistan. Certainly the Persian delegate was there and delegates from Turkey, but the United States was not officially represented.

I trust that this Congress will make its voice heard and have a bill passed that will allow us to be represented at the next Congress. After I got through, I took a trip through some of the prominent countries of Europe, and you may like to hear some of the things I found there in the way of road building in comparison with our own progress in the same direction.

We must remember that England and many parts of Europe had roads when American was not known to the white man.

The roads of England go back beyond the Christian Era and the Romans were pretty good road builders, because they built their roads sometimes as much as 3 feet thick and put on plenty of metal and didn't wear them out and couldn't wear them out; so in the foreign countries they have the advantage of us of having had good roads many centuries and having only to add to them.

In England I found them building twelve miles and a half of new road, called the Fosseway, which was the transformation of an old Roman road into a modern one, and they told me that was the longest mileage of new road that had been built in this century.

So you understand their problem is largely one of improving and maintaining roads, but in maintaining roads they give us cards and spades and put us to shame, because, in going almost everywhere in England, over 230,000 miles of good roads, I hardly saw a mudhole or a dirt road in all England.

With their little concentrated island about the size of New England, they have about 50 per cent more good roads than we have in all this great United States.

As the richest nation in the world, we should be the leader in this road problem instead of the follower.



The great State of New York, from which I come, and whose highway board I am connected with as consulting engineer, is the leader in the world today in road expenditures. It has appropriated \$100,000,000 for new roads, some \$75,000,000 of which are still unexpended.

This is a greater sum than any nation in the world has appropriated for new roads.

Should it not be that our great State of New York should take the position of leadership that our nation and our Congress is ready to follow.

In the matter of organization of their roads abroad and of their personnel, I think they are far ahead of us. I found every man an enthusiast whom I met, and not a man who is drawing his salary alone, not a man who is looking for the loaves and fishes alone that come out of his position, but he was honestly, earnestly enthusiastic about what he was doing and accomplishing and felt that he was almost doing a holy work.

I met one man who was the engineer and Highway Engineer of one of the counties in England; he was the fourth of his family who had held that office. It had been held before him by his father, his grandfather and his great grandfather.

That man was as proud of his position as a Road Engineer and the office he held, as any man could be proud of being President of the United States.

In France, their great department of roads and bridges is probably the best organized of that of any nation in the world and in Germany they are almost equally well organized. It has a splendid department.

In the same direction, the roads of Switzerland, which is a very poor country, and where, in some cases, the roads are only 6 feet wide, that is, the third class or communal roads, everyone of them is metaled or macadamized, and everyone of them is good to travel over. We must bring ourselves to this same situation. We have got the ranking member of the road committee of Congress with us and a very prominent member of the appropriations committee, and we have also a member of the cabinet.

I think we should lay our plans before them, urge good roads upon them heartily and earnestly and see if we cannot get a great national as well as nationwide disturbance and excitement upon this subject and we will have real progress upon this great road problem and prosperity will follow.

Mr. Diehl in the chair.

THE CHAIRMAN: There are no other speakers on the program for this morning and I thought, unless there is some objection, or other gentlemen here wish to address you, that an early adjournment might be taken, in order that you may be here promptly at 2.30 this

afternoon. The first address of the afternoon is by the secretary of agriculture, who is the direct representative here of the national administration. He is here at the invitation of the officers of this Congress, who called upon the President of the United States about a month ago. It is urged that every delegate be here promptly at 2.30, so that the representative of the government can see our interest in this movement and that he can be enthusiastically and earnestly welcomed.

## GENERAL SESSION

UNDER AUSPICES OF AMERICAN HIGHWAY ASSOCIATION

Monday, September 29, 2.30 p.m.

President Page in the Chair.

**THE CHAIRMAN:** The Congress will please come to order. It is my very great pleasure and privilege to introduce to you the Secretary of Agriculture, Hon. David F. Houston.

### ADDRESS BY HON. DAVID F. HOUSTON

*United States Secretary of Agriculture*

I am greatly pleased to be received in such generous and friendly fashion by this sturdy band of highwaymen. I feel no alarm whatever either for my possessions or life. Obviously, times have changed and we have changed with them. You differ radically from those who used to operate along the highways, at least, in attitude, but if I may judge from some expressions that I heard this morning, there is a suggestion of resemblance as to the holdup, with no little balance to the credit of your predecessors in the matter of the modesty of expectations. I am not here to attempt to convince you of the need for good roads. I might easily consume the time allotted to me in discussing the relation of good roads to rural life, to the increase of production of farm products, their easy and economical distribution, the betterment of the physical conditions of life in the country and its social and intellectual attractiveness. There is no manner of doubt that the rural life problem, so-called, is one of the most pressing and important that engages the attention of thoughtful men.

I am not here to try to convince you of the necessity for good roads or of their economic and social advantages. This would be ridiculous excess, and I shall assume that you are already thorough converts to this idea and that your mission in life is to bring the people generally to your way of thinking. I am here to encourage you in your efforts so far as my presence and few words may serve as encouragement, and to further evidence the interest of the department of agriculture, and therefore of the federal government, in this important undertaking.

You know, of course, that the department of agriculture has been directly concerned in good roads for many years, and since 1893 has been actively engaged in investigative and educational good roads work. The first appropriation made for this purpose was the exceed-

ingly modest one of ten thousand dollars, the bill directing the secretary of agriculture to investigate systems of road management throughout the United States. This resulted in the establishment of the office of road inquiry, whose scope and field of usefulness has been broadened until the department has a somewhat comprehensive organization known as the office of public roads. Without much question the importance of this organization will be further recognized and its activities extended. It maintains laboratories for testing and research work, issues numerous publications of an educational character, and maintains a corps of the best highway engineers and road experts obtainable. It has actively aided states and communities with suggestions or advice, and has made demonstrations of its methods as opportunity has presented. It has aimed to be, in a sense, the last and best word in the nation on matters of road construction and road administration. Its function has been primarily educational, and as such it has been recognized to be of great value.

Recently Congress took a step of great importance and significance. Under conditions specified, it made an appropriation of half a million dollars "to be expended by the secretary of agriculture in coöperation with the postmaster-general in improving the condition of roads, to be selected by them, over which rural delivery is or may hereafter be established," and provided that such improvements should be made under the supervision of the secretary of agriculture. It made this appropriation contingent on the appropriation by the state or the local subdivision thereof in which such improvement was to be made of double the amount of money for such improvement. As the regular appropriation for the office of public roads is approximately three hundred thousand dollars, it will be seen that the department of agriculture has been charged with the supervision of an expenditure for roads of about one and three-quarter million dollars.

So much for the interest and activity of the department of agriculture. Even more striking, of course, has been the interest aroused in the several States of the Union and very marked has been the development. Ten years ago only a handful of States had any expert central machinery to encourage good roads and to supervise their construction and these were confined to the New England and Eastern Middle States. Today twenty-four States have reasonably efficient highway commissions, and thirty-three have central agencies of more or less importance. Ten years ago the appropriation by states for good roads slightly exceeded two million dollars. In 1912, the appropriation was over forty-three millions, which was over 40 per cent of the total estimated expenditure by the States up to December 31, 1911. It is estimated that aside from these federal and State appropriations there was expended locally in 1912 over one hundred and seventy-five million dollars, and quite significantly it is also estimated that from 20 to 40 per cent of this local expenditure was, relatively speaking wasted.



Progress in the last decade is gratifying. It is not singular that this activity should not have been witnessed in the preceding decades. Up to a comparatively short time ago, the people of this nation were pioneering the continent. They were primarily concerned in harnessing the natural forces, in establishing the Union, and in insuring that it should not "perish from the earth." The history of a new nation epitomizes that of the race. At first men must concern themselves with the great problems of existence. Government activities are restricted to the establishment and preservation of order. Developmental and cultural activities are the last to receive attention in a large way. Until population reaches a fair degree of density, individualism dominates thought and action, and only as population and production increase does the sense of community of interest rise and does individualism wane. Theories of government arising out of these conditions pervade legislation and administration. The notion that government is a necessary evil obtains, and that that government which governs least, governs best.

We have passed out of this stage. The notion that the government is essentially coöperation is fastening itself in the public mind, and the conviction grows that things of vast economic and social importance can be done through community agencies with great saving of waste and with adequate efficiency. One gratifying thing today is that people are demanding that their various governmental agencies devote themselves to the vital, essential, economic, and social problems, and when this idea prevails with some universality throughout the nation, there will be some guarantee for the diversion of the resources of the people from the destroying and wasteful expenditure for war to the constructive and helpful expenditure for the development of society. The concrete evidence presented by expenditures for roads, especially by the State or local communities, furnishes encouragement for those who desire to see these communities preserved as vital parts of our governmental arrangements.

No one questions that the States and the localities should largely contribute to the support of roads, and I take it in view of the state of mind of the public, as expressed through its unofficial as well as its official channels, and through concrete legislation, that discussion of the wisdom of federal encouragement and aid would be merely academic. The main questions for consideration are questions of the extent and character of such aid, and of methods and machinery—federal, State, or local. Let us briefly as may be, call to mind certain of the controlling considerations.

The suggestion of great national transcontinental roads appeals to my imagination, as does the suggestion of interstate roads connecting capitals or cities of commercial importance to my logical faculty and to the sense of pleasure that I experience in riding about the country in my friends' automobiles. But that the essential thing to be done is the providing of good roads which shall get products from the community farms to the nearest station and make rural life more profit-

able, comfortable, and pleasurable, I entertain no sort of doubt; and it is obvious that the representatives of the people in Congress are like minded. For in making their appropriation, they stipulated that it should be used in improving the condition of post roads with a view to the economy and efficiency of postal delivery and for the transportation of farm products to the market. Such roads are equally essential to the establishment and operation of decent elementary and secondary schools for the benefit of the country boys and girls. I do not eliminate other things for consideration, and I do not underestimate the rights and pleasures of the automobilists and the service they have rendered in the propaganda for road building.

There are complex problems to be solved in many States before the most efficient expenditure of money by States and communities for roads can be secured, and there are many more to be worked out before one can rationally expect the federal government largely to participate. Who shall say how aid should be apportioned so that the States may receive equitable treatment? Shall it be apportioned equally among the States on the basis of total population, farm population, area, taxable valuation, road mileage, or all these; and should federal money be expended exclusively through its own agencies for a certain system? What roads are to be improved? There are approximately two and a quarter million miles of publicly-owned roads in the nation. Half of this mileage is utilized for post roads and less than 10 per cent of the total can be classed as improved in any large sense. Shall we undertake to apply aid to all the roads, or shall we consider this task too gigantic? Shall we apply it to the rural routes or shall we regard this as equally beyond reason? Or shall we single out certain directions in which central roads shall run, and if so, how? Is it not clear that this opens up a field where petty politics, community interest, and individual selfishness may run riot? Assuming that we have settled this, for what purpose shall the aid be granted, and in what proportion? Shall it be exclusively for construction, exclusively for maintenance, or for both? Shall it be to pay the entire cost of either or both of these items, or shall it be dependent on the equal or larger contribution by the States and communities? Shall the aid come through votes of money out of the treasury or from the sale of bonds?

That the suggestion of federal aid to road building raises grave questions and involves possible dangers, no thoughtful citizen doubts. There are proposals before the public mind which would bankrupt the federal treasury and suggest possible abuses before which those of the worst pork-barrel bills of the past would pale into insignificance. No proposal which does not carry with it the assurance of safeguarding the treasury in this direction seems to me to stand the ghost of a chance of favorable consideration. It is not alone the fear that there would be no stopping place. There is the question of precedent. This is not the only proposal before the American Congress involving the suggestion of huge appropriations. There are others which to



their advocates are just as important and are being just as insistently urged; and many of the veteran Congressmen have naturally contracted the habit of balking automatically at such proposals.

It would be especially pernicious if such aid should result in stifling the spirit of local self-help. In this field, as in others, the States have recently made great headway, and any action taken should unquestionably result in the fostering of this spirit and in the efficient direction of the activities to which it may lead.

Another difficulty to be avoided is the over-centralization of activity in these intimate internal matters and the building up of a great and powerful bureau in Washington, with an ever-increasing control over the highways of the country. The dictates of prudence and experience are that so far as possible, such agencies as may be required should be efficiently developed in the several States and that the federal agencies should work in a spirit of complete and helpful co-operation and assistance.

The first practical essentials in the planning of road legislation would seem to be to recognize the States as the smallest unit with which the federal government might deal. This would give relief in a measure from the insistent demand that would come from every township and every district in the Union for its share of State or federal assistance, without reference to the merits of the case or the practicability of the undertaking. As has been stated, many of the States now have efficient State highway departments, and thus afford organized agencies with which the federal office could deal. It would seem that the basic feature would be such coöperation between the States and the federal government as would leave with the States the initiative in the selection of roads to receive aid, and as much of the immediate construction and maintenance as would be practicable. In the case of roads on which federal money is to be expended, it would seem essential and wise that the federal agency should have the requisite power of the approval of the selection, supervision of the construction and maintenance, and the right of inspection, for the plain and simple, ordinary purpose of seeing that the federal money is applied to the purpose for which it was voted and is efficiently expended.

It is reasonably clear that for every reason there must be some automatic check upon the demands to be made upon Congress, and that this should be afforded through the requirement that the States and the localities should contribute an amount both for construction and maintenance at least equal to and possibly double that contributed by the federal government; and that, in the apportionment of any possible federal funds, a number of basic factors, such as population area, wealth, or minimum cost of construction, should control, I have not the least doubt.

There may be those who "will view with alarm" any suggestion that the federal government coöperate with the States financially in road building, and more especially that it exercise an adequate meas-

ure of control and supervision even over the expenditure of its own funds. The cry of centralization—that the federal government aims unduly to extend its powers, may again be raised. Yet, in a field of common interest and of inseparable activities, what could be more natural than coöperation and mutual assistance? Why should the two jurisdictions serving the same people forever stand apart and view each other with suspicion and distrust while nothing is done or much is wasted? And is it not worthy of note that the alarm never seizes such people at the stage of the discussion in which it would be of most value? They are not in the least timid in their approaches to the federal treasury, and their courage fails them only when it is suggested that the federal government has a right to see that the money of the people of the nation is wisely and efficiently expended. If they are to take counsel of their alarms, let them do so before they determine to assault the treasury.

In short, as a practical program, I believe that this matter is one in which haste can best be slowly made. The people will sanction a reasonable expenditure of their money—and it is their money and theirs only, whether it be expended through the federal government or the State—when they are convinced that it is applied to a wise purpose and will yield the results anticipated. And I am impressed by the wisdom of the action of Congress, in the midst of so much clamor, in constituting a committee “to make inquiry into the subject of federal aid in the construction of post roads, in providing an appropriation of a half-million dollars to be expended coöperatively with the States in the proportion of one to two, and in requiring the secretary of agriculture and the postmaster-general to report to Congress the results of such expenditure “together with such recommendations as shall seem wise for providing a general plan of national aid for the improvement of postal roads in coöperation with the States and counties, and to bring about as nearly as possible such coöperation among the various States as will ensure uniform and equitable interstate highway regulations.” This indicates a wholesome desire to know the facts as well as generous interest. Too short a time has elapsed to judge of the value of this undertaking, but that it is in the right direction, few will question. That it might be extended with ample funds if aid is to be furnished, most thoughtful men would concede; and the plan has the peculiar value of being susceptible of indefinite extension in case the results should be found to justify it.

THE CHAIRMAN: We have the great pleasure of having with us as our next speaker the deputy minister of railways and canals in Canada. As the secretary of agriculture mentioned a few hours ago at luncheon, there was a man in southern Texas who had done more to drive desperadoes off the border than any other man. He came to New York once and went to a banquet. Someone said to him, “Why, how did you manage in chasing these desperadoes when you got them near the line? How were you able to tell which side of



the line they were on?" He said, "There ain't no line when I am after a desperado." Now, we have a distinguished gentleman coming from our good neighbor, Canada, the Hon. A. W. Campbell. It is my pleasure to introduce him.

#### ADDRESS BY HON. A. W. CAMPBELL

##### *Deputy Minister of Railways and Canals in Canada*

I am sure that we appreciated very much the kind invitation which was extended by your department of roads to the government of the Dominion of Canada, to send a representative here to meet with you on the occasion of this, your Good Roads Congress. I was very glad indeed to have been appointed to carry the greetings of that government to this Road Congress and to say that we are working along the same lines that you are working today, with the object of trying to improve the condition of the roads throughout the Dominion. Now, you might ask why I, as deputy minister of railways and canals, should be interested in this question of wagon roads and what knowledge I should have of this great economic measure and upon what authority I can speak to you on the subject. I look upon our system of transportation on this continent as being made up of wagon roads, railroads and water roads or the highways of the sea. These three branches form our great transportation problem, our great transportation system, and no system of transportation in any country is complete without it comprises these three elements, and of these three elements I consider that that branch known as the common wagon road is the most important. In studying this question I find that it is one which requires the very closest possible attention and involves the lifework of any individual who expects to become an expert and who, as such, can speak with authority, and in that very comprehensive address which has just been delivered by your honorable secretary of agriculture, you can easily see that he has grasped the whole situation, has summed it up in that brief and concise manner and has struck the word of warning which must be taken to heart and considered by everybody, whether he has to do with the actual construction and maintenance of roads or not. I am a civil engineer by profession and for fourteen years I devoted my time as a road commissioner in the Province of Ontario, to this question of road improvement or this movement for better roads. Since that time I have been devoting my attention to the other branch of transportation, known as the railway and waterway, but still I consider that my studies have been along the same line and that notwithstanding the fact that I have planned nearly a quarter of a century in connection with this great problem, I am still a student of it, and your worthy president, who is looked upon as being the greatest authority in road mak-

ing today on the continent of America, will tell you that while he has practically spent a lifetime in the study of this question, yet there are phases of it which are new to him and which he still is studying and trying to get more light upon. The ramifications of the transportation system are so great, that any plan which must be laid down in order to meet the requirements of road improvement in the different sections of the country is so extensive or so comprehensive that it does require the study of a genius and an expert from every class of the community to sit down as one committee and thresh this thing out, and still we will be lacking in some respects all of the knowledge that is required to solve properly, capably and efficiently, this great question. Now, sir, I am still a student, and, like the desperado mentioned in the incident related by your president, whenever a good roads congress is convened in the United States, it seems but natural that if we in Canada receive an invitation, that we should attend, regardless of the fact that it may be held in another country. I come across here from Ottawa to Detroit without thinking that I am crossing a boundary line, and I come in here to discuss this question and to absorb some of the information which you are retailing, with the greatest possible ease and comfort, just the same as I would go into one of our own municipalities and hear the matter discussed there. I am not forgetful of many pleasant occasions on which I have met in conference the people of the United States on this problem and I certainly feel deeply thankful for many of the profitable suggestions which I have received at these meetings and carried home to be given effect to in our own country for the benefit of our people, and if at any time I should happen to drop some suggestion that might be of benefit to you, I will only feel that we are paying some small percentage of what we have received by way of valuable information from your people and from your very capable department of roads at Washington. Now, sir, why should I say that the question of common roads is as important as that of railroads? Simply because the common road is the feeder of the railroad and the railroad is the feeder of the steamboat line. Close up the wagon roads of this country and the railroads would die of starvation. Your great ocean freighters would rot at their moorings, yet before the era of railroads great civilizations prospered. They had, however, good wagon roads. That is why I attach so much importance to the wagon road end of the transportation system and that is why I say that the very best brains and minds of the people of this country can afford to apply themselves to a study and consideration of this question. The very figures which were mentioned by the honorable secretary today show you the enormity of the problem and show you some of the difficult phases of this question, when we come to consider that great problem of national or state aid. If we would undertake such a plan as he pointed out, what roads are to be improved? How are we to base the assessment? Is it on population

or assessed value or on area, with the minimum or the maximum applied? He has sized up the situation in a nutshell there and that is one of the difficult problems that we are confronted with today. How is the tax to be levied? What roads are to be improved and upon what basis is this levy to be made. This question, however, you will discuss and this is a question which you will solve, because it is true that wherever you find that there is a necessity for improvement or where a great national work should be carried out, it is surprising how quickly you, on this side of the line, determine the ways and the methods, and it is surprising how enthusiastic you are in seeing that it is carried as quickly as possible to a final result. We are watching you closely in this connection. We are going to try to follow some of the suggestions that will be made at this meeting today, because we require suggestions in this connection, but we are anxious, you are anxious, that if federal aid or State-aid for road improvement is to be adopted in our country, that the plans will be thoroughly considered and properly matured before any money is expended, to secure that a dollar's worth of results will be produced with every dollar that is expended. It is an unfortunate thing today, but it is one which must be admitted by every citizen who gives the question the slightest thought, that in our country as in your country, on the roads generally, I am speaking now, millions of days of labor and millions of dollars of the people's money is being wasted and practically buried in the mud. The result is useless and it would be better for us to have conserved our labor and have saved our money than to have undertaken a great percentage of the expenditures we have made. Unfortunately, now, in connection with the ordinary roads, we are not giving them the thought and consideration which we should. Many of us here today are disposed to consider the great question of national roads or expensive roads, and it would appear as if we can afford to devote our time to a consideration of these, because they involve large outlays and the expenditure of thousands of dollars per mile, but that to give attention to the ordinary road would be so commonplace that it is useless for us to think about it. The ordinary roadmaster or pathmaster in the parish may look after the common road, but as soon as it is determined to spend millions upon the through roads, then we, as engineers, are prepared to take a hand in that connection. I think it would be well for us to consider carefully and well how should the ordinary road be improved, then how should the next class of more importance be improved, and then how should the interstate or intertown road be constructed in the most capable and efficient manner so as to provide the least resistance to the traffic passing over it? Now, in any of these connections it is advisable that we should carefully plan the work. That building of the lateral road, the artery leading back into the farm yard with a few hundred dollars per mile, requires careful planning, careful supervision and careful attention, and if we are



to consider the question carefully we will determine that these lateral roads are deserving of just about as much consideration as the more important roads. When it comes to the more important road, it appears as if we can find plenty of experts who will spend their time in planning and supervising these, but let me say in that connection that whatever expenditure is to be undertaken, before we commence that expenditure we should see to it that provision is made for a proper system of maintenance by which these roads will be cared for and this investment will be protected, and the work which the people are taxed for, especially of the more expensive character, should be looked after in that systematic way that the maintenance will be reduced to a matter of repair by never allowing the road to get out of repair. The stitch in time in this connection is worth millions to us and no suggestion of the expert today can be more important than that we watch the road carefully and see when it commences to unravel or when a rut appears on the surface or when the slightest little repair is required; have it attended to. That is the time to make the repair, not after the road has become impassable and requires an expensive outlay to bring it back to condition. Now, in many of your States, as with us, carried on by this agitation, we find that a good deal of temporary work has been done; the ordinary, waterbound macadam road has been constructed, and in our desire to improve a great mileage to satisfy the people, at least for the present, we have gone on spending large sums of money, only to find that these roads have not been built sufficiently permanent to withstand the heavy and rapid traffic which they are subjected to at the present time. The automobile of today, with its very heavy load, requires a very strong road to support that load, and with its rapid movement, requires that this surfacing should be bound together in a manner that will not unravel or be shifted by the speed of these heavy, fast-moving machines. Even the change in the class of traffic has brought us face to face with the study of almost a new problem in connection with roadmaking and in my time this phase of it certainly is one of the most difficult. How we should construct—I heard a man one time say that he could make a road with 6 inches of material, good, hard, tough broken stone, that was just as serviceable as 16 inches of material, because it was argued that it was the earth foundation that carried the load and that the broken stone was simply placed there to form a crust or a surface to withstand the wear and to shed the water, but that the foundation carried the load. The experience of the older countries in road building for centuries has demonstrated that that road must be of sufficient strength to carry the load and that the strength of the road must be in keeping with the maximum load that passes over it, not the mean, not the minimum, but the maximum, and that at the most trying season of the year. In the older days, these roads were built from 18 inches to 3 feet in thickness and built of large stones laid in the bottom, following with a smaller grade, until it is surfaced with the

finest material; that binds the whole together, but the large stones, up to 2½ inches in diameter, must be brought as nearly as possible to the surface; then the surface must be bound with the finer material and this should be cemented together by the use of either some form of bitumen asphalt or cement. Which of these is the better for the much traveled roads, for ordinary work, for the primary road, is a question I want to hear discussed. It is not yet settled and it will, I think, take even more meetings than this to settle it to the satisfaction of all, but it is a very important question in connection with your deliberations here, and it is one of the questions that I am chiefly interested in and I would be very glad indeed to have it discussed and to hear it discussed before I go away. I am delighted to be here, to have this opportunity of hearing Secretary Houston sum up this whole problem. I am sure that I carry greetings across the border with me to the Canadian people and the Canadian government. We are working along the very same lines, the lines for improving or making better the condition of the common highways throughout the country. These lines, no doubt, will be classified among parish and county, intercounty to state roads, interstate roads to national roads and national roads that will end way across this border, joining together the two sections of the great American continent, and let us hope and wish that these roads may be used for the peace and good will of all those who wish to freely travel on them.

THE CHAIRMAN: It is our pleasure to have with us a man who, at a road congress, needs no introduction; Colonel Sohier, chairman of the Massachusetts highway commission.

### LESSONS LEARNED AT THE RECENT INTERNATIONAL ROAD CONGRESS IN LONDON AND OBSERVATIONS OF FRENCH AND ENGLISH ROAD SYSTEMS

BY COL. WILLIAM D. SOHIER

*Chairman Massachusetts Highway Commission*

The Third International Road Congress was held in London the week of June 23-28. Some twenty-five hundred delegates attended, representing countries all over the world. The leading road engineers of the world were present, and the papers, which were printed beforehand, were most interesting. I, and I am sure every American delegate who attended, felt amply repaid for the trip by having the opportunity to meet so many distinguished engineers representing so many countries. Personally, I learned more by meeting and talking to these engineers than I did at the sessions of the Congress itself, where there was not time for full discussion because the subjects covered too broad a scope to make discussion of details possible.

I am sure I am speaking for the American delegates when I say that I feel it was a shame that the United States should not be officially represented and should not be a member of this International Road Association.

The United States has not joined as a nation and was, therefore, not represented by delegates representing the nation. This was mortifying to all of us, and I believe it was bad for the country itself.

All the European countries and England not only belong, but were represented by large numbers of their leading engineers, men who would rank with any of our engineers in this country. It would seem to them as if the United States was not a nation, but merely an aggregation of States, to find that she was not represented and had not joined.

I personally represented the State of Massachusetts, and many of the other delegates represented other States. The State of Massachusetts joined the Congress as a State; and, out of courtesy, not as of right, our delegates were recognized. It should be a right and not a courtesy.

By having Massachusetts, New York, and other States represented in this way, by courtesy of the convention, merely puts us on the same footing as Siam or Borneo. It was very mortifying, and I believe, very poor policy for this country. I hope that all members of this Congress, representing all the States in the Union, will join with me in my endeavor to see to it that this is rectified before the next International Road Congress.

#### RESOLUTIONS ADOPTED

We could well study the resolutions adopted by this and the former International Road Congresses. Naturally these resolutions are very conservative, because they have to represent the diverse views of various countries where conditions and road systems are totally different. Therefore, the resolutions should be carefully studied, and followed almost everywhere. In some places it would be well to go further in the same direction. I will only mention a few of the resolutions adopted.

#### PLANNING OF NEW STREETS AND ROADS

1. On general principles it was decided that new main roads on through routes should be constructed by passing outside rather than through the small villages. This would make the road safer and would be much less expensive than a wholesale tearing down of buildings, which would be necessary to get sufficient width in the villages.

2. Grades should be as easy as possible, especially where there was much heavy traffic.

3. Curves where there was fast traffic should provide the best possible view and the longest possible radius. When a short radius was inevitable there should be marks showing the danger.



4. Street railway tracks, if they could not be placed in a specially reserved place, should be in the center of the road, and space should be provided on either side for two tracks for vehicles.

5. In laying out new main traffic roads sufficient space should be allowed for what may ultimately be required, like street railway tracks room for fast and slow traffic, etc.

6. The planning for these main roads of communication should be undertaken at once, and it was important that central State authority should take interest in the matter and be given, to some extent, the supervision and authority.

There were so many other resolutions adopted that I cannot mention them in this paper, but they will amply repay study, covering as they do "Types of Surfacing to be Adopted on Bridges, Viaducts, etc.," "Construction of Macadamized Roads and Bituminous Macadam Roads," with full particulars as to the way of building, materials to be used, and how to use them; resolutions as to wood paving, methods of lighting highways and vehicles; and conclusions regarding various causes of wear and deterioration of roadways noted since the 1908 International Road Congress.

I might note in this connection that the resolutions recognize the fact that the high-speed, light motor vehicles rapidly destroy water-bound macadam roads, but did not cause serious or exceptional wear or damage where the roads had been properly treated with some bituminous material, except on curves. Also, that it was most important with heavy traffic that the width of tires, the diameter of the wheels and loads to be carried should be regulated.

A resolution was passed relating to the regulation of fast and slow traffic to the effect that some authority should be established to regulate and direct this traffic at all congested points, and that the regulation should define the rights, duties, and responsibilities of each kind of traffic, including not only vehicle traffic, but pedestrians.

A resolution was adopted that the unit of highway administration must always be sufficiently large and should command sufficient money so that a competent staff of engineers could be employed. This question is of great importance in this country; in fact, of more importance it seems to me than any other, because I believe that in many places the public money spent on roads is largely wasted from the lack of proper engineering advice and adequate supervision.

I would call special attention to one particular resolution, as it seems to me most important at this time in this country where so many States are borrowing money, and even the national government has considered entering into the work of road improvement. This resolution is to the effect that borrowing money for new main road construction is only consistent with sound financial principles provided the loan period, in the case of loans for renewals is kept well within the life of the surface coatings, and of course provided also that the loan period is kept well within the life of the road, or enough of it is paid during that period to cover the deterioration of the road surface.

## ROADS IN FRANCE AND ENGLAND

I spent about ten days in learning all that I was able to about the roads in France, and the same in England, in addition to special trips which I made to see particular pieces of roads, particular pavements, etc., in and around Paris, London and Liverpool.

I examined something over one thousand miles in France and the same number of miles in England. While I recognize fully that this did not give me sufficient opportunity to really be familiar with road systems in France and England, and therefore my observations are not conclusive, I feel it may be worth while to present a few of them which were interesting to me and may, therefore, be interesting to other road builders.

## THE COST OF A ROAD SYSTEM

We must not expect too much in this country, where we have some two million miles of public roads. We must recognize the money which will be required and the time which must elapse before we can even think of attaining the position that France and England now hold in regard to roads. Their roads have been built for years, and to a large extent they have been built of macadam for years.

In France practically all the roads are already built and very few new ones will have to be built. Their whole problem is one of maintenance.

It would be well for us to consider the magnitude of the problem.

France has about twenty-five times the area of Massachusetts, and has about twelve times its population. Practically all over the country its roads are laid out on a uniform width, and are of almost uniform construction of some form of macadam. All road work is done under the supervision of the government engineers.

France has about 24,000 miles of national routes and 8,000 miles of departmental routes. It has over 107,000 miles of what might be called country roads, 47,000 miles of roads that interest several communities and 184,000 miles of country roads. Their total road mileage is 371,700 miles, and it cost \$1,663,000,000 to build it.

We must remember that their roads were built years ago when land was cheap and when their labor was much cheaper than now, and that their labor cost today is not more than half the labor cost in most parts of this country.

Even with their low cost of labor their national roads cost something over \$12,000 a mile; departmental roads \$7,700, a mile; county roads, \$6200 a mile, and their local roads about \$2500 a mile, or an average cost of nearly \$4500 a mile.

But most important of all is the fact that the annual maintenance of these roads costs nearly \$45,500,000 a year, of which \$6,500,000 is provided by the national government and \$39,000,000 by the eighty-six departments. The amount furnished by the departments is practically \$1 per year for each inhabitant, man, woman, and child.



To secure any such road system in our little State of Massachusetts, with her 23,000 miles of road, means years of work and over \$100,000,000 in money. At the smallest calculation she would have to spend \$5,000,000 a year for the next twenty years to build her trunk lines and secondary roads alone.

I think we can, however, all profit a great deal by studying the French road system. The most important lesson of all that they teach us, it seems to me, is that we should secure proper locations for our highways, sufficient width for all future use (their main highways are 60 feet in width), and wherever possible we should secure that width in our location.

The macadam on the national routes is 24 feet in width, on the departmental roads 18 feet, and on most of the other roads about 15 feet. There is a grass shoulder on each side, about 15 feet in width.

Of course I have not time to give more than a few general observations.

The first and most important is that they are spending over \$45,000,000 a year for maintenance on 371,000 miles of road. This is about \$125 a mile a year; and we must remember that all of their roads have been built for years and are practically today all waterbound macadam roads, where they have not already put in some more permanent form of construction.

I see by the papers that their minister of public works is now recommending that \$50,000,000 additional be provided to be used during the next ten or twelve years for some bituminous binder on some 6000 miles of national roads. I may say in passing, it is greatly needed.

France has undoubtedly the best road system in the world so far as location, layout, foundation, drainage, etc., are concerned; but where there is much motor vehicle travel—and that is near the cities—their macadam roads are going to pieces, and just as fast I think as our waterbound macadam roads have in this country since the advent of the motor vehicles. Wherever the motor traffic is heavy, near the cities, I found the macadam roads extremely rough and going into pot holes as they are here; but it is only fair to say that this observation would not cover many miles of road in all out of their 371,000 miles, because, especially near Paris, they are already using tar or some bituminous binder, either in construction or as a surface coat.

One noticeable thing in both England and France was that except near the cities one did not meet even 10 per cent of the number of motor vehicles that one usually encounters here, at any rate in the eastern States. This accounts for the fact that their waterbound macadam roads have stayed in such good condition.

Traveling as I did on the main routes in Touraine through the chateau district, Brittany and Normandy, which are very popular, I think I often did not meet more than ten or twelve motor cars in 100 miles, and there were very few teams except near the villages.

As we all know in France they have a patrol system. You still see the piles of stone on the roadside ready to be broken up and put on the road, but in the whole 1000 miles which I went over, on perhaps only four places—less than a quarter of a mile each—did I see any dry stone put upon the road to fill the holes, and in these instances it was scattered over the road by the motor vehicles as it is in this country.

They have found it necessary there to use some binder in their patches, and in both France and England on their main roads I found they were using tar. They were painting the bottom and painting the stone with tar, and covering with sand, or filling in with stone that was already coated.

It was evident to me that in neither France nor England can they maintain waterbound macadam roads where they have more than fifty automobiles a day, and keep them in reasonably good condition, without the use of some bituminous material.

Every road that I saw in France had a ditch on each side to carry the drainage. This ditch was usually placed beyond the 15-foot grass shoulder, and had waterways connecting into it.

On almost all of the main roads where there was a grade of 3 per cent or more, they had a shoulder on the side of the macadam and a paved gutter about 4 feet in width. This was made of larger blocks of stone than ordinary paving stone.

One very noticeable thing, and one that we could well copy, was that the gutter was laid out on almost the same crown as the road, so one could travel on it without any inconvenience.

The crown of the roads there was flatter than ours, not more than  $\frac{1}{2}$  inch in the foot; often less.

I saw many places in the villages and in the parks near Paris where the gutters were across the road. These gutters were constructed so wide, and so shallow, that at any reasonable rate of speed (say 15 miles an hour) an automobile would go over them without having anyone inconvenienced, even in the back seat.

#### ENGLAND

I must pass on to English roads.

In England they have a different road system than that of France. The county boards and county engineers have charge of the main roads outside villages, though the central government is now helping to improve main roads, and has a competent board of engineers to advise on the kind of improvement to be made.

The central government has some \$5,000,000 a year with which it is helping its counties to make improvements. This, by the way, is secured from a tax of 6 cents a gallon on gasoline, and from the motor vehicle fees, which are extremely large; for instance, a 40 h.p. Packard would be taxed about \$110 a year in England, and other cars in proportion.

I should judge that England had on its main roads much more motor traffic than there is in France; although even in England, so far as I went, there was very much less motor traffic out in the country than there is in this country, though there is a tremendous motor travel near the cities, particularly in London.

What is particularly noticeable in connection with the English traffic is the tremendous number of traction engines and trailers, which one meets everywhere, hauling 8 to 10 tons, on iron tires.

I understand from their engineers that this kind of traffic will rapidly cut through and destroy any macadam road which is less than 5 inches in depth. So far as I could learn, they are now building most of their heavily traveled main roads of at least 9 inches of macadam, the top 3 inches of which is made of bituminous macadam or a tarred slag.

In and around London they have tremendous numbers of motor 'busses, which travel in rubber tires, and often go 10 to 25 miles out in the country, with a five minute service. They are practically like our 6 ton trucks.

The road surfaces there are remarkably good, and they have now about 40,000 miles of road where the surface has been coated with tar. On the whole, I should say that their road surfaces on main roads were much better than those in France because they have used much more tar and bituminous macadam. In England and in France they are covering all their tarred surfaces with sand, gravel or pea stone and dust.

On the other hand, the English layouts are inconceivably bad. Their roads, even on the main lines of travel, are extremely narrow, and the corners very blind. Often there is not room to pass the traction engine that one so frequently meets.

I hardly expect to be believed, but I went over very many miles of road where the road ran between banks, or between walls, where there was absolutely not room to pass sometimes for from an eighth to a quarter of a mile, and then one could only pass at a turnout. I measured several such roads where the distance between banks on the road was only nine to eleven feet.

The surfaces, however, were almost uniformly good except near the cities where the motor travel was heavy; and here again the water-bound macadam road was full of holes and rapidly going to pieces when it had not been treated with tar. It is only fair to say, however, that most of them were treated with tar. Right near Hyde Park in London I saw as rough a piece of macadam road as one could find anywhere in this country near any of our cities.

One of the most noticeable things about the English roads, as with the French, was that the whole width of road surface was made suitable for travel from shoulder to shoulder. This, of course, was necessary in England where the roads are so narrow.

The most severe criticism on the English roads today would be that they have not sufficient width, have very bad corners, and in many



places not only no sufficient provision for drainage, but practically almost no provision whatever.

Many times it looked as if the road was going to carry the water from the surrounding country, and would be something more like a drainage canal than a road, in a heavy downpour.

They have, however, realized the importance of the drainage problem and are rapidly making great improvements.

#### MAINTENANCE

We can learn a great deal from the English in the matter of maintenance. With a total of over 150,000 miles of road in England and Wales, they classify as *main* roads 27,800 miles. The average cost of maintenance of these 27,800 miles of road is \$475 a mile a year. We should remember this in this country.

Ninety-five thousand miles of road in England are maintained by the local authorities; they are called *rural* roads. Even on these roads the average amount spent for maintenance per mile a year is \$115.

Remember that their labor costs much less than in this country.

On 2173 miles of road maintained by the London authorities (not including the London County Council), the average cost of maintenance is \$1675 a mile a year, or that was the cost some years ago; I am informed it has substantially increased since that time.

No wonder they can keep good surfaces.

The engineer in the County of Lancashire, Mr. Schofield, told me that he had something over 600 miles of road to maintain, and that this year he had an average of \$1500 a mile for maintenance. Of course, we must remember that "maintenance" means not only ordinary maintenance, but includes resurfacing and even reconstruction.

Mr. Schofield told me that many of his roads had an average of from 50 to 75 traction engines, hauling trailers, going over the road every day. He said they had absolutely destroyed the 6 inch water-bound macadam road, and that he was reconstructing his roads with what we would call a telford base and 9 inches of macadam, with the top 3 inches made of bituminous macadam. To build a road of this character in Massachusetts would cost from \$20,000 to \$25,000 a mile for a road 18 feet in width.

In the towns that I went through in his county he was building granite block pavement grouted with cement laid on a 6-inch concrete base.

#### OTHER LESSONS

I can only give a very few observations of the other things that I saw.

In England and France I saw many places where resurfacing was going on. They were uniformly resurfacing with what they called a granite, either Belgian or Welsh; what we should really call a trap.

What impressed me particularly was that if they resurfaced at all they used what we call a No. 1 stone, at least a 2½- or 3-inch stone, and only about 10 per cent of the finer stone. This was true wherever they were resurfacing.

In France where I saw them resurfacing they were generally using stone alone, but in England they were putting on slag, coated with tar, of this large size, or a 3-inch stone coated with tar.

Their method was to lay this stone, what they call one stone deep, roll it slightly, and then roll in 10 per cent of No. 2 and some chips coated with tar.

I saw several of these roads, which carried very heavy traffic, that were in very good condition indeed, although three or four years old.

In Liverpool I saw one tar macadam road built by the so-called "Brodie method," which is to grout the top 3 inches No. 1 stone, when it is rolled, with a mixture of equal volume tar and sand. The sand is heated to the temperature of the tar, the mixture kept agitated and poured evenly into the stone until it flushes to the surface, and then 10 per cent of No. 2, or finer stone, rolled in. This road was eleven years old, and still in very good order, whereas a waterbound macadam road, just beyond, carrying the same traffic, had been resurfaced three times in eleven years, and today is rougher than the tar macadam.

#### ROADS NEVER CLOSED

I was informed that they never close the road in England or France for resurfacing. Personally, I must have gone over at least one hundred places where the roads were being resurfaced, and invariably—whether it was waterbound macadam, tarred macadam or tarred slag—they were repairing one-half of the road only and left one-half over which one could pass reasonably comfortably.

In some instances where they were laying tar macadam they held the middle of the road with timber. Near London they had a policeman at each end of the section where the work was in progress, and vehicles went through in single file. This particular road had so much heavy travel that each of the four times I went over it I should think there were at least twenty vehicles, two or three of which were motor busses, that had to wait until the other line got through.

The method by which they did this in the country, however, was to spread their stone or tarred stone, or slag of large size, over half the road, and roll it lightly, then put on the finer material and roll that, then spread the other half.

Four or five places where I inquired I found that they did very short stretches at a time, and at night finished up with a square end.

At no place in either England or France could I discern any line in the middle of the road where the joining came.

In England the crown was only 1 inch in a yard and the surface almost invariably went from bank to bank, wall to wall, or shoulder to shoulder, so that one would travel over the entire width of the road.



In England, as in France, the patches they were putting onto their macadam roads were made of tar on all main roads. They did not try to patch with stone alone.

There is still another observation I would like to record, and that is that the tars in England seemed very much more lasting and elastic and more sticky than ours.

I only saw possibly one mile of road in all where the tar surface seemed to be picking up; in other words, where the stone showed below it, and in that instance it would undoubtedly be patched at once and before a pot hole came. With that one exception, their tar surfaces were practically perfect. There were no pot holes, and when one dug into the tar it always seemed alive, sticky and soft.

In the past I heard several things that I think are not so now. One was, that they coated their roads with tar in England and France and did not cover the tar with sand or dust. This I think is not true; first, because I saw the sand cover used everywhere, or else a covering of pea stone and dust. On every road I examined or passed over a covering had been used. Also I inquired of the engineers of the English road board, and they told me there was only one county left in England and one engineer now who thought he could put on tar without using a cover. All the others said they had to use the cover to prevent damage to clothes and vehicles, and most of them believed it added to the life of the road.

Another thing: On only a very few miles of road was there any of that mosaic effect that we had been told about. The engineers tell me that that effect came the first year when they had used only say one-sixth of a gallon of tar per square yard, and where it had worn off on the tops of the stones, but when they received a second application, with sand covering, it made a blanket coat just such as we have in this country.

Most important of all, the English roads are constantly maintained. Remember the money available and necessary on the main county roads; two counties with \$1500 a mile a year.

In Massachusetts we find we can maintain our oil and tar surfaces most economically by having a team and two or three men constantly patching from 6 to 8, or even 10 miles of road. If this work is well done we never have any holes.

Another important consideration was that in both England and France all road work is in charge of competent, trained engineers, who not only have technical training, but many years of practical experience. They stay in office as long as they are competent and efficient; it is not a matter of politics. They have entire charge of road building and road repairs, and employ efficient foremen and workmen. These facts largely account for the results obtained.

#### STREETS WHEN BUILT ARE NOT OFTEN DUG UP

Another most valuable lesson, that most of our cities, especially, could learn from the practice in most of the cities abroad, and that is to leave your street surfaces alone after they are built.

When this is impossible, and the street has to be dug up, the street department re-lays the pavement or surface, and collects the expense of putting the surface into good condition again and maintaining it for a reasonable period of time.

Water pipes, local sewers, gas, electric conduits, etc., should be so located that they can be connected with the buildings without disturbing an expensive street pavement.

If this cannot be done, then the authorities in charge of the streets should, as I said before, do all necessary work to put the street surface into good condition and the cost should be borne by the company or department which required the digging.

Thousands, and perhaps millions, of dollars are wasted yearly in this country in building roads and streets only to have them dug up and made nearly impassible in a year or two.

It is no unusual sight in my State to see a street dug up twice or three times in one year, and it is hardly ever properly repaired. In consequence, paved streets that would have remained in good condition twenty to forty years, have to be reconstructed in five or ten years at enormous cost. In the meantime they are in wretched condition.

The time has come, in my opinion, when no one should be allowed to dig up our roads and streets anywhere, no matter how influential the corporation or individual may be, without their having to pay to the department in charge of the road, enough money to put the street back into its former condition, and keep it there.

Perhaps the best way would be for the street department to collect a uniform amount for each square yard of street surface disturbed, the amount to be collected differing with the cost of repairing and maintaining the trench on the different classes of pavement or surfaces.

#### CONCLUSION

In conclusion, I would not discourage any "good road" movement in this country, but we must go at it in a proper and scientific manner and know what our problem is before we tackle it, then proceed in a businesslike manner to build our roads.

We must realize the enormous amounts of money involved, and we must also realize the tremendous amount of money that is required to keep the roads in good condition after they are built.

In my opinion we have engineers who can do as good work in this country as anyone has done abroad. We can build equally as good roads.

We may even learn to build them better, but we must realize that it requires education, skill, intelligence, and experience, and that constant maintenance is absolutely essential.

Maintenance begins the day the road is built, and continues as long as it is used, and the money for maintenance must be provided as well as the money for construction, or we shall find that the bonds issued to

construct our roads still remain to be paid while the roads have passed away in dust long before.

The money cannot be provided nor the roads built at once. If we are to secure good roads we must all join hands, the town, the city, the county, the State, and possibly the Nation also, but it must be upon a carefully prepared plan made by competent engineers, after a full study of the whole problem. Only by coöperation can our country secure any comprehensive highway development within the next twenty-five years.

THE CHAIRMAN: At the present time there is great difficulty in securing highway engineers, but fifteen or twenty years ago there were even fewer, and the majority of the engineers now have accumulated a great part of their knowledge under the tutorship of the next speaker, who, for many years, built highways in the State of Connecticut, who is recognized as a highway builder of note, who is recognized as a good roads advocate, who is second to none in enthusiasm and energy, who is going through the State of Pennsylvania today, campaigning for the \$50,000,000 appropriation, a man who organized the Road Builders' Association, and a man whom good roads enthusiasts all over the country delight to honor. It is a pleasure to introduce the dean of the highway engineering fraternity, Mr. James H. MacDonald, of Connecticut.

#### ADDRESS BY JAMES H. MacDONALD

*Former State Highway Commissioner of Connecticut.*

I remember when I was quite a small boy, and that was more than twenty-seven years ago, my father, who was very religiously inclined, took me to class meeting with him, and he specially enjoined on me that at the next class meeting I should have to stand up and speak to the brethren and sisters. Not knowing as much as I do now about public speaking and what an effort it is at all times to do so, I consented. I remember that during the week I prepared myself for the little occasion and when the eventful day came and the hour and the meeting, I got up and said, "Brethren and Sisters," and then I forgot all about what I had so carefully arranged, and a dear old sister in the back of the room started that old, familiar Methodist hymn, "Tongue cannot express the sweet comfort and peace of a soul in its earliest love," and I wanted to hug that dear old lady just at that moment. I had arranged in my mind some little thoughts on the subject-matter that had been assigned me, but after hearing the very eloquent remarks of the gentlemen who have preceded me and the intelligent interlarding by the very eloquent chairman, I find myself just about in the same position as at that little prayer meeting.

Truly history repeats itself, and then, to crown all, I have had to sit and listen through these two sessions and then at another meet-



ing, to all about great Babylon, what someone else has built. I have no patience with all this talking about the fact that cows in Connaught have long horns; unless you've been to Connaught you don't know whether they have or not. Now, this talk about the roads on the other side is not borne out in point of fact by all the conditions that surround the question. I have been across the continent, I have been in twenty-two States and I have been abroad and I want to tell you that American engineers have nothing to learn, either in regard to new construction or care and maintenance of roads. The chief difference between the two countries is simply this: we are building new roads and they are keeping in repair the roads they have already constructed. I have been over many miles of roads in New England and other parts of the country and found them in just as fine a condition, in some instances a finer condition, than those I saw abroad. So that I get out of patience when people are continually harping about those things that they know practically nothing about. Within fifteen miles of Paris, it is with difficulty that you can sit in your automobile. The great trouble with our people is that we are prone to take the suggestions about things that someone else has seen as law and gospel and compare before investigating conditions. I venture to say that had things been reversed and the people in the old world been transferred to where we are on this continent, they would not make the showing that we do here in this great and glorious country of ours.

It is not so many years ago—and, Mr. Chairman, you will pardon this little digression, because I can't help it, that's the Scotch in me—since the little *Mayflower* landed on our shores and had her sides washed by the waters of Plymouth Bay—not three hundred years ago—and what did they find? An unbroken wilderness, rocks and hills and the habitation of no man, and in that short period of time we have taken that wilderness and made it to blossom as the rose and to become the granary of the world. We have made those old rocks and hills to give us greater treasures than was ever possessed by the Queen of Sheba. What we have done along other lines that go to make a successful and progressive country, we will do in regard to this good roads matter. We have just taken it up, that's all.

I am at a loss at this late hour and with the length of the session in extending this last remark. When Brother Terry was talking about the whale story, I was thinking of the old lady who was quite a crank on interior decorations and carried it to excess, and one day became a little faint. She reached into the cupboard to get a little wine to rejuvenate her and by mistake she got a bottle of red ink and never discovered her error until she had gotten outside of the red ink. Immediately they sent for the doctor, but when the doctor came and relieved her by removing the cause of her illness, being a dry joker, he remarked, "Madam, this interior decoration has gone too far." Now, I come from the little State of Connecticut



and my subject matter suggests that I be a little careful how far I go with my little talk here today.

Ten years ago I was in this little zone that this meeting is held in—the sun parlor of the Wayne Hotel. There the American Road Builders' Association was practically given birth. From that Road Builders' Association, the nucleus of which was five men, interested in the wheel, it was the bicycle at that time, have grown many associations, and I have attended the meetings and deliberations of nearly all of them, but I have never attended a meeting where the interest was greater and where the intelligence in regard to that which is necessary to be done was more manifest than at this meeting. Nor have I ever been able to see in all of the deliberations of these conventions, gentlemen like yourselves who have sat through several hours, with deep interest to learn still more what there is to be learned.

I come from the little State where they say that Washington and Lafayette sojourned for a short time when we needed their assistance. In my travels through the State, which embraced every town in it, I have been pointed out numerous rooms that George Washington slept in and I have had indicated to me many trees that Lafayette sat under and ate his dinner, and after having had so many rooms pointed out that Washington slept in and also so many trees under which Lafayette ate his dinner, until I come to the reasonable conclusion, that George Washington and General Lafayette must have spent all of their time sleeping and eating, and I wonder how they had any time to do any fighting.

The little State that I represent commenced with small beginnings. An annual State appropriation of \$75,000 was all that we had. To give you an idea of how the interest has grown, just before I resigned my office by the will of the governor, owing to the fact that I had made a mistake in the caption of my ticket, which mistake I believe I should repeat if I had to do it over again, I let a contract for \$400,000, the largest contract ever let to any contractor in one contract in this country. The State of Connecticut is very far from being a wealthy State, and when the last speaker was enumerating the States, there rose in my heart a feeling of great joy and pride to think that I had been able to serve my people in that community for nearly eighteen consecutive years. I am very glad to know that the people of my State occupy such a proud place as they do. For twelve long years there never was enough money placed in the hands of the highway commissioner to do one mile of even a water bound macadam in any one town. It was the duty of the commissioner and he gladly accepted the privilege of going out amongst his people and getting acquainted with them. I can remember very well one year of having only \$500 to spend in each one of thirty-two little towns and making a survey with a lock level, and sitting down on the side of the road, computing the yardage, and letting the contract direct to the officials of the

town. I also remember that this small beginning in these thirty-two towns resulted in the little towns themselves asking for an appropriation of \$9000 at the next opportunity. It is a delightful narrative for me to relate.

Not all of you gentlemen here of the forty-one States represented, come from the great States of New York or Pennsylvania or the States with a large levy to draw from. There are many States that have as yet hardly entered upon or made a beginning in State aid, and perhaps from some of the little things that I may relate in regard to my State, there may be some thought suggested that you may take away with you by way of encouragement, and if there is anything I hope you will feel perfectly free to appropriate it and I shall be very glad to have you do so.

State-aid for highway improvement came up through introduction of the State Board Trade. After the passage of the law the little towns of the State had access given them to participate, not in accordance with their mileage of roads, not in accordance with their area, but in accordance with their grand levy,—the wealth of the town—as the unit of measure. Almost from the commencement of State-aid our towns began to appreciate the fact that their roads were not entirely local but general in their use and a public possession and therefore should be paid from the public purse. We saw right away that a wise move had been made on the part of the State in coming in to assist these little towns in the construction of these roads that were to be used more generally than heretofore, for an improved highway always invites travel. Therefore the appropriation was made on the basis of the grand levy which is the total valuation of the town. The towns came in and accepted it. We have been in the road movement some nine consecutive sessions, our sessions being held biennially. As Brother Terry says, you may amend your national law without limit; we amended our road law nine consecutive times and I presume they will continue to amend the law every two years to meet new conditions while it remains on the statute books of the State. All the grand levy of the entire State does not suggest that we took up any extravagant form of construction; only \$9,000,000 with a million people, with a total area of 5004 square miles and 15,000 miles of roads, the largest mileage of roads of any State in the Union, per area.

Today the department has \$6,500,000 to expend in that little State, \$3,000,000 of this amount covers an unexpended balance I turned over to my successor, when I resigned my office as highway commissioner and a new appropriation of \$3,500,000 for the use of the present commissioner. I don't make the remark with conceit, but I do make the statement as something worthy of emulation that that is the largest amount of money being expended by any State in the Union on the basis of population, \$6.50 per capita. Now, how was that brought about? By considering the condition by which



each town in the State was surrounded and not importing one dollar's worth of material if the material to be found in that town would take care of the road question and build a road that would be competent to sustain the travel that the road had to bear, and that is the best definition I know of for a good road. If it was a graded road it was put down as a sub-soil job. If it was a gravel road it was laid in courses with a good foundation. If it was a macadam road, the material was carefully selected, not only in reference to its quality, but also in regard to the method of construction employed and the dimensions of the stone used. If it was a question of drainage, all the necessary drainage was put in. The proposition is simple, get the water out of the road, off from the road and away from it—out, off and away. A well built house must have a tight roof and a dry cellar, so with a road, it must have a water proof top and a good foundation. That's the whole science of drainage in my judgment.

A system of fourteen trunk lines was early laid out through the State, that drained a population of 852,000 of a total population of a million people, and went in and out of 132 towns out of a total of 168 towns. No one knows better than Brother Terry, who has been right in the forefront of this great movement, who has fought many obstacles successfully and always with great courage, that the strongest argument that has been raised against national aid for our highways is the one that he used when he says, "Every man wants to have that road built in front of his own house," and the nearer you get to that the nearer you will get to having a unanimous vote. But some people fail to appreciate this fact that most of the money used in this country in the past for the improvement of our highway system in any State has always been where the most voters reside, and the isolated farmer—the man on the outskirts of the borough or town—who has been paying his taxes year in and year out uncomplainingly, got scant treatment. It remained for State-aid to come in and make these connected roads, and in giving to the isolated farmer access to a splendid road as some return for the taxes he has been paying. You are assisting the town every time you build a trunk line system, because the town's money, formerly spent on these roads where the most people reside and which are generally the trunk line roads, can be used on roads not trunk lines. Thus the entire movement both from a State and Federal standpoint will be benefited by an intelligent system of trunk lines.

Now we come down to another question that you have not met here. On the other side I traveled for days and did not begin to see the number of automobiles that I find with us in the East. Why, during a whole day's travel outside of the environs of the large places I rarely ever met an automobile. Sixty-five per cent of the travel on our roads are the automobile and 35 per cent the horse drawn vehicles. Now, that question of traffic is never alluded to very much here. They regulate their traffic and protect it; they also

build the wheel scientifically. Where have you ever seen a wheel here whose diameter was 7 feet, with a tire 8 inches in width, in this country and in common use, and where the horses are hitched tandem and where everything that way is done scientifically? It is as much as a man's political or official life is worth today to force this question of wide or narrow tires here in our country. In my State we have placed on the statute books a wide tire law but its application has been extended from year to year thus giving the farmer a chance when he purchases a new wagon to be within the law. It is needless to say that such a law is a farce and the old wagon is patched up and no new wagon purchased. You have got to have all those things done and it means time, money and patience. Another thing that we have had to contend with is the splendid development of the automobile. It has been a development. No commissioner ever anticipated what would be required of him in the rapid development of automobile traffic. I delivered an address in Boston ten or twelve years ago and the topic was, "The Country Road and the City Street," and I know that I never alluded, even in passing, to the question of the automobile. I devoted the whole of my thought to the destructive force on those roads of the hoof and the wheel, and how the mechanic and how the chemist was busy and busy as they could be, to see whereby he could shoe that horse and that wheel to destroy the road. I stood a short time ago on the roof of one of the largest buildings in Hartford looking down on our main highway, and the street was full of automobiles. It is only a few years ago when I looked over the record, 225,000 automobiles, I thought that was a goodly number, but what do I find now? That is all changed. It's a million five hundred and some odd thousand, that's the record of automobiles, not to say anything about the motor trucks. You don't hear very much about the destructive force of the motor truck. We commissioners, who are a little unfortunate in not having the contractor live up to the specifications, are inclined sometimes, I am a little afraid, to lay the blame on the automobile. But I do not hesitate to say that a large part of the trouble is faulty construction.

Now we have a new element coming in, we have motor trucks and traction engines. Now we have to begin and reconstruct and on these great through lines we have to provide a construction to combat this tremendous traffic. No man was more devoted to the water-bound macadam road than the speaker, and I am still of the same mind, by reason of the fact that I have utilized the old macadam roads by putting on a bituminous surface over the old macadam roads that have been down many of them for seven-teen or eighteen years, thus restoring them to a smooth water-proof surface. Because you know if you get a good, smooth surface you are not going to offer any resistance, and when you don't offer any resistance you remove friction and when friction is removed



you minimize wear. I am not going to say what particular plan I adopted, by reason of the fact that I read a story once that is very appropriate here, in which a gentleman visited with an old son of Erin where he saw a deal board set up on two bricks and in the center of the deal board was half a brick and a faded flower and the gentleman's curiosity was aroused, and he asked, "What is it that you have got there, what is that for?" "Well," he says, "that is what sent me to the hospital and I remained there for three months and the faded flower on the brick is the flower from the grave of the man that threw it." So that I am not going to say anything about what particular material was used in the assembling of the stone, because that would be very unfair, but come over into our State and investigate for yourselves. But the evolution of our work has been to educate the people to do that which our intelligence and experience suggests is right and to spend their money economically and honestly and see that the work is done well, and also that the upkeep of that road is sufficient to keep it in good condition for three hundred and sixty-five days in the year.

I had intended to extend my talk but the hour is late so I shall close. I thank you, gentlemen.

THE CHAIRMAN: It is my pleasure to introduce as our next speaker, the Hon. Frank W. Buffum, State highway commissioner of Missouri, who will give us a talk on "The Missouri Plan."

## THE MISSOURI PLAN

BY HON. FRANK W. BUFFUM

*State Highway Commissioner of Missouri*

When I was called here to speak, they failed to state what my subject would be. I telegraphed and asked what it would be, because a Missourian is liable to speak on 16 to 1 if he isn't notified—that is, sixteen miles of good roads to one of bad. But when I came here this morning I hunted around and found a program and found that my subject was to be, "The Missouri Plan," or system or something of that kind, and so, without preparing any speech for your special benefit, I will give you, as far as possible, the plans and methods and what the highway department of Missouri has been trying to do in the last year, or portion of the year. Missouri has had some counties with some very fine roads, and a very large number of counties with a very large mileage of very poor roads. It has been brought about, not so much by the desire of the people not to have good roads, as the fact that our laws were very deficient as to the spending of the money, the raising of taxes, and the otherwise handling of the funds of the State. My predecessor, Mr. Curtis Hill, a very fine gentleman, started in under the board of agriculture. At the end of his term, Governor Major, feeling that

the highway department should be a department of its own, had a bill put through the legislature, establishing the highway department, of which I had the honor to be the first Highway Commissioner in the State. It was not my pleasure to become the highway commissioner of this State, but one morning I found a letter on my desk, asking me if I would take the place. My business interests were such that I delayed two days before I answered it, but at last, at the solicitation of some of my local friends, I took the place and am trying to do the best I can to upbuild the State of Missouri. Our governor is one of the greatest road enthusiasts in the United States. He is the one who organized the two Good Road Days in the State, which have gone all over the United States, and the correspondence that comes to my office, asking for some information in regard to this, would surprise anyone. The results we have obtained from the work of those two days surprised us. At first it was taken to be a joke by some portions of the State, but when we got through and when we had shown that with proper organization of our department, with the assistance of the governor, and with the assistance of the press, we got out in our State, it is estimated, in the neighborhood of 200,000 people working on the roads of the State, it is estimated that we spent \$300,000 on those roads either in labor or subscriptions on those days, and if that is the case, we certainly have spent \$1,000,000 since, because they are going right ahead with this work; they never stopped after the two days was over; they saw what they could do, and we are getting results from those two days; they will be made Good Road Days legal days by law at the next session of the legislature, and I hope, in courtesy to our governor, that the different States will make the same two days throughout the United States Good Road Days, because you will get results that will certainly repay you a hundredfold for your trouble. In regard to the road law of the State of Missouri, I would say this to you, that we have what is known as the local district, generally known as the 8 mile district, being generally 8 miles square, but not necessarily so, and included in this district must be an incorporated city or town and this plan is carried on to a great extent around the larger cities, and, in fact, around some of the smaller towns. It works with very good results, and also, they can raise bonds in that district, if they desire. A very large number of them don't raise bonds; I have warned them to be careful of the bond issue, reading as I do, in many papers, of the troubles that come later in other States, or, if they raise their bonds and get their money, to be sure it is not wasted by being spent all at once through some enthusiast who comes in, gets the money, spends it possibly honestly but injudiciously and is off again, and you have nothing to show in return in the way of results or for the future maintenance of your roads or replenishing of your road system; but the bonds have to be paid.



But the greatest law ever put on the statute books of any State is what is known as our county seat to county seat drag law. The law itself does not show anything very great in it; it simply gives \$15 a mile a year for the dragging of roads between county seats over routes to be selected by county commissions and approved by State highway commissioner. That is not where the good results come in from the law, however. It brought a very large number of miles into our road system, in the neighborhood of 12,000 miles or equivalent to about one-half the way round the earth, if I remember my geography right. That being the case, we have an immense amount of mileage. Now, when I took this office, I made up my mind that if I was going to have roads I was going to have them and there wasn't going to be any half-way business or foolishness about it. I was going to try to run it like you run a business, get my overhead expenses down, find out where the leaks were, find out where we didn't have good roads and why we shouldn't have them. I have been in this road game about fifteen or twenty years and I found out that we spend the great bulk of our money putting wooden tops on bridges and have nothing left to fix our roads with; consequently, I insisted on concrete or other permanent culverts being built in our State, and before any one of these 774 roads were established, nearly 7 to each county, I established a system of rules which they must comply with before I would declare it to be a county seat road, because there happened to be a clause in the bottom of that law that said they couldn't have a road until it was approved by myself; and this is what I put in the form:—That all roads should be at least 40 feet wide; that they should be 30 feet graded, that they should be graded at least 2 feet high in the center, if it became necessary; I didn't think they'd get up that high, but if they did it wouldn't make any difference, because a dirt road will get down anyway; that the culverts should be not less than 30 feet and should be all installed at once, and bridges installed as rapidly as possible and with concrete tops; that all hedges should be cut to 5 feet on the highways, so that the roads would get plenty of light and dry out in the spring; that all hedges should be cut and pulled 150 feet from the corners to eliminate the dangers of automobiles passing around the same; that where there was a gravel pit within 2 miles of any road, they would agree, before the first day of July, 1914, to either rock or gravel that road; that all hills should be reduced to at least 7 per cent grade. Now, we are getting those results. I did not think we would, but when I found that about 30 per cent of the counties had gone to work and had done that much then fully 30 per cent more did so when they found it was necessary and I insisted that the balance of them should do it, because I said, whatever the others have done, you must do, you must do it or not get your road. Then sprung up a rivalry immediately. When a county would back out and say, "We won't build that kind of a road," I said, "It's with you; you will be given thirty days and if,

within thirty days, I come back and your road is not fixed, I will locate a road in another part of your county;" and they at once got busy and I don't remember even a single county that has thrown up the privilege to get a highway from "county seat to county seat," because I tell them that possibly in the next legislature more will be given to the counties that have taken care of their roads. We have across our State some trails and we are trying to build them up as fast as possible. We are urging that they be made complete, that they be pushed at once and finished, and when a trail does not get up and get a move on itself, I do the same thing I do with the county seat road, start another trail, and don't you ever forget, they get busy right quick on the other one that had it established, because, if you establish a trail and have them understand that they have it, they will simply go into the house and into a Rip Van Winkle sleep. We are trying to get five or six trails across the State of Missouri east and west and the same north and south and are pushing them to a finish. We hope for federal aid on this trail work and also on some other work through the State, but I am not a believer in establishing through routes across the State by Federal aid entirely. I believe it will come and be endorsed by the congressmen of our State very quickly, as soon as we can take care of our local roads that lead into these roads; in fact, it will get to a point of not merely wanting it; they will insist that we have Federal aid for our through highways and federal aid will come and be welcome. We are doing road work on one basis, "Do it now; don't put it off." I aim to ride every road between the county seats. I keep four automobiles in service in the State of Missouri and I go from one to another and get around from county seat to county seat and hold meetings with our commissioners. If the roads suit me, I approve them, and if they don't, we sit down and argue the matter out. They must go the right way, not be built for the building up of some town or for the killing of another, and not be done with malice or prejudice, but be done for the good of the State. We are getting these results, getting them promptly, straight from the shoulder. We are not fooling away our time, but we are working every day. The *St. Louis Republic* started the good roads fund in our State and raised for me the sum of nearly \$4000 for machinery. I am ordering the machinery now, sending it to different portions of the State, cutting down the hills in one place, grading in another, and scattering that work over the State in such a way as to bring to our State a good roads system. A road is like a chain; a chain is no better than its weakest link, and a road is no better than a bad piece in it. If you have a bad piece in the road, a man can ride 150 miles and strike that bad piece and never forget it, and we are trying to get the bad pieces out and get the roads handled in a systematic manner. We are trying to have the money spent in the right way and we are bringing men and carrying them around, showing them the latest improved machinery. I brought two men with me here at the State's expense,



men who will have charge of two of the outfits, and as soon as I get through with them I will take other men to other conventions and let them see machinery, see the latest and most improved methods of building roads, and thereby we hope to get up a system of road building in the State of Missouri that will not be equaled in the United States. I thank you.

A MEMBER: I would like to ask the gentleman what he builds his roads out of in Missouri?

MR. BUFFUM: In Pike County, we build our roads from gravel entirely or almost entirely; in other counties, we build them of crushed rock; in other places, of crushed rock with a top dressing of gravel. One of the finest roads in the State is between Hannibal and Palmyra; it has been given a calcium carbide treatment and they have been very successful. A very large number of our roads are dirt roads, but we have from the railroads a tariff of one-half a cent per ton per mile that practically puts crushed rock at the door of any community that wishes to take advantage of that tariff. That does not give the railroads much profit, but the railroads are interested in the road work and are willing to give us that rate, and we are bringing that rock to the prairies where they have no rock, and establishing rock roads in that way. We have fifty counties that have plenty of rock, and we have fifty more that have scarcely any rock exposure in them at all, but I have found out that many counties that thought they had no rock, by going around, could find an exposure of a small place, and if I can find a foot of rock in a county I'll find the balance of the quarry.

THE CHAIRMAN: President Page, in pursuance of the custom of these conventions, has appointed a committee on resolutions. The personnel of that committee will be announced by the secretary, Mr. Pennybacker.

#### Committee on Resolutions

*Chairman, GEO. C. DIEHL*

Representative at Large, James H. MacDonald, Former State Highway Commissioner of Connecticut.

Alabama.....	W. S. Keller, State Highway Engineer
Arkansas.....	Judge Joe Asher
Arizona.....	Judge T. G. Norris
California.....	A. B. Fletcher, State Highway Engineer
Colorado.....	A. J. Lawton, Commissioner Public Works, Colo. Springs
Connecticut.....	R. L. Saunders, Deputy State Highway Commissioner
District of Columbia.....	Charles P. Light, Field Secretary, Amer. Highway Ass'n.
Delaware.....	John Bancroft
Florida.....	
Georgia.....	Prof. C. M. Strahan, Dean of Engineering, U. of Ga.
Idaho.....	

Illinois.....	A. N. Johnson, State Highway Engineer
Indiana.....	C. S. Kenyon, Indianapolis
Iowa.....	Prof. T. M. MacDonald, State Highway Engineer
Kansas.....	W. S. Gearhart, State Highway Engineer
Kentucky.....	Robert C. Terrell, State Engineer
Louisiana.....	W. E. Atkinson, State Highway Engineer
Maine.....	Lyman K. Nelson, Chmn. State Highway Commission
Maryland.....	R. Keith Compton, Chmn. Paving Commission, Baltimore
Massachusetts.....	Lewis R. Speare, Former President A.A.A.
Michigan.....	P. T. Colgrove, President Michigan State Good Rds. Assn.
Minnesota.....	Geo. W. Cooley, State Highway Engineer
Mississippi.....	
Missouri.....	Major Frank W. Buffum, State Highway Commissioner
Montana.....	Wm. Jordan, Jr., City Engineer, Helena
Nebraska.....	G. E. Parisoe, Secy. Omaha-Lincoln-Denver Assn.
Nevada.....	
New Hampshire.....	S. Percy Hooker, State Superintendent of Highways
New Jersey.....	A. G. Batchelder, Chairman Ex. Comm. A.A.A.
New Mexico.....	Francis E. Lester, Pres. State Assn. Highway Officials
New York.....	Geo. C. Diehl, Chmn. Good Roads Board, A.A.A.
North Carolina.....	Dr. Joseph Hyde Pratt, State Geologist
North Dakota.....	
Ohio.....	L. M. Brown
Oklahoma.....	Col. Sidney Suggs, State Highway Commissioner
Oregon.....	J. R. Penland, Albany
Pennsylvania.....	John A. Wilson
Rhode Island.....	John A. Richmond, Member State Board of Pub. Roads
South Carolina.....	W. P. Cantwell, County Supervisor, Charleston
South Dakota.....	
Tennessee.....	Dr. J. D. Henderson, Knoxville
Texas.....	Judge Albert S. Eylar, El Paso
Utah.....	
Vermont.....	J. W. Votey, Dean of Engineering, Univ. of Vermont
Virginia.....	Capt. P. St. J. Wilson, State Highway Commissioner
Washington.....	M. Roy Thompson, County Engineer, Tacoma
West Virginia.....	Geo. B. Chorpeneing, Member State Roads Commission
Wisconsin.....	A. R. Hirst, State Highway Engineer
Wyoming.....	A. J. Parshall, State Engineer
Canada.....	The Honorable A. W. Campbell, Deputy Minister of Railways and Canals, Ottawa, Canada

## FEDERAL LEGISLATION SESSION

September 30, 10 a.m.

UNDER AUSPICES OF AMERICAN AUTOMOBILE ASSOCIATION

Mr. Diehl in the Chair.

THE CHAIRMAN: The A. A. A., under whose auspices this meeting is held today, is an earnest advocate of road building. It is believed that we will never have connected and properly developed system of highways until the cities of the country pay a fair share toward the cost of construction. For a hundred years good roads were a local issue and the entire cost of the construction was borne by the locality. A century has demonstrated that this system does not result, except in isolated cases, in good roads. In sections where there are large cities, County aid laws frequently accomplish an equitable division of the expense between the city and the country, but where there are no large cities the unit must be extended and a State law is necessary to secure a proper division of the expense. There are many states which are so relatively low in taxable assets that the unit must be still further extended and the Federal Government, through legislation, must be called upon to divide the expense of road construction in these states between the rural localities and large cities of the country.

Three distinct methods have been suggested for federal participation in road building and it is with a view of having a full and fair discussion that we have asked the advocates of each of those plans to be here today. The first plan seeks to distribute the government money throughout all the townships of the United States, so that every mile of the 2,000,000 miles of highway may receive some small portion of it. The second plan seeks to build main highways in coöperation with the State, with the initiative with the State, and with the approval of the Federal authorities. The third system seeks to have the government build a so-called federal system of trunk lines, connecting the various capitals, and running from ocean to ocean and from the lakes to the gulf.

The foremost advocate of distribution among townships is with us today. He has been in Congress a good many years and is probably one of the most aggressive road enthusiasts in Congress, and while some of us, myself included, do not agree with his plan, we recognize his ability and aggressiveness. We are glad to have him here, and, like him, we are from Missouri and want to be shown. It is a pleasure to present Hon. Dorsey W. Shackleford, chairman of the committee on public roads of the House of Representatives, which we hope will be the most important committee of Congress.



## FEDERAL ROAD LEGISLATION

BY HON. DORSEY W. SHACKLEFORD

*Chairman of House of Representatives Committee on Roads*

I esteem it a distinguished honor to have been invited to address this great road congress. The deliberations of this body, if wise, must advance the civilization and promote the happiness of this already highly civilized and happy land.

Nothing is more essential to the prosperity, the intelligence, and the happiness of the people than easy and convenient ways of travel and transportation. The degree of a country's civilization may, in a measure, be gauged by its highways.

The term highway is not to be limited to mere roads but must be held to embrace oceans, rivers, canals, railways, and every other means over which people or property may be carried.

No country has a more extensive and adequate system of highways than the States of this Union. With their vast coast line, indented by multitudinous harbors; their canals; their innumerable rivers, with unbounded possibilities for navigation; their millions of miles of well-constructed and efficiently maintained railways; their more than 2,000,000 miles of roads of varying degrees of perfection, the American people may well be proud of their possessions and their achievements in the matter of highways.

The subject upon which I am expected to talk today is, "Federal Road Legislation."

Whatever doubts may have formerly existed, it is now generally conceded that the federal government has authority to construct and maintain roads which are used for federal purposes. This granted, it follows that it also has authority to aid the States in the construction and maintenance of roads which are in part devoted to federal use.

There are at least three sources from which Congress gets power to legislate in relation to roads: First, to provide military roads; second, to provide post roads; third, to provide roads over which interstate commerce may be carried.

To what extent these constitutional powers should be exercised is a question which will severely tax statesmanship to answer.

Primarily it is the duty of the States to provide their inhabitants with roads, and it would be a long step backward if congressional legislation should afford them any means for avoiding this fundamental obligation. On the other hand, to provide an adequate system of roads lays a heavy burden upon the taxpayers of a State, and it is no more than justice that the federal government should contribute to the upkeep of the roads of the State which it uses in the performance of federal functions.

It can not be doubted that an overwhelming majority of the people want federal road legislation; but, unfortunately, they



radically differ in opinion as to what such legislation should provide. They are divided into two general classes, which for the purposes of this discussion may be designated as the "touring-roads" class and the "business-roads" class. The "touring-roads" class is marching under a banner upon which is inscribed in letters of gold: "See America first." The "business-roads" class is marshaling its forces under a flag which bears the legend: "Cheaper transportation and lower cost of living."

The "touring-roads" class is largely made up of rich automobile owners, who desire to spend a part of their leisure in touring the country. These are reinforced by manufacturers of road machinery and road materials, who regard Uncle Sam as "good pay," a liberal buyer, and one who would be a valuable customer if only he would embark in the business of building "national roads."

The "touring-roads" class demands that the United States shall limit its road activities to the construction and maintenance of a few "ocean-to-ocean" and "across-country" highways of great perfection and then leave the rest of the people to build their own roads or do without, as they may choose.

The "business-roads" class believes that in dealing with roads we must keep in mind their functions and the relation which they bear to the general transportation system of the country; that, as the harbor is the terminus of the river and the railroad, so, for practical purposes, the railway station is the terminus for roads; that neither freight nor passengers will ever be carried long distances over roads as cheaply as they could be over railways, and that it is an idle dream to imagine that auto trucks and automobiles will take the place of railways in the long-distance movement of freight or passengers; that the proper function of roads is not to connect antipodal oceans nor the distant capitals of far-away States, but to make easy communication between the farms on one hand and the towns and railway stations on the other, to the end that the farmer may market his crops at less expense and the town dweller may get farm products more easily and at less cost. They therefore favor a general system of roads radiating from the towns and railway stations out among the farms.

I am quite convinced that a large majority of the people belong to the "business-roads" class, but they are not here today. They are at home sowing wheat for a harvest from which all of us must get our bread. They have neither the time nor the money to travel across the continent to attend road congresses. Nevertheless, Mr. President, they are the plain people—the producing masses—upon whom we must all depend.

Mr. President, I have been accused of being antagonistic to automobiles and automobile interests. It is not true. I am an automobilist myself and a member of an automobile club. I believe that no economic instrumentality has contributed more to the progress of our times than has the automobile industry.

I do not want to see the number of automobiles in use diminish, but rapidly increase. I want to see the whole country supplied with a general system of average good roads and every farmer replace his horse and buggy with an automobile. I want the time to speedily come—and come it will—when the products of the farm are hauled to the towns and the railway stations in auto-trucks, when the fields are plowed, the crops cultivated and harvested, by self-propelled tractors. If I shall live my allotted time, I will see all of this. Even now the time has already come when the automobile is no longer regarded as a mere toy of the idle rich, but as the utility vehicle of the plain, everyday business man. It also affords me pleasure to know that there are now more autos in the country than in the large cities.

The "touring roads" advocates have two plans, by one of which they hope to secure some high-class "See America first" boulevards.

Their favorite plan is to have the United States, independently of the States, build and maintain a system of "national roads." If they shall not be able to get these "national roads," then their next plan is to have the federal government and the States jointly construct and maintain a limited mileage of excellent "across country" roads.

Under both plans the primary purpose is to get "touring roads." To accomplish this they feel that they must, as far as possible, get away from local influence and local control.

The "national roads" movement has had most of its momentum imparted to it by the American Automobile Association and the National Highways Association. The first of these is an association formed to promote the pleasure of its members, to whom "touring roads" are a necessity.

The leading spirits in the other—the National Highways Association—are gentlemen who are, or have been, connected with the manufacture of road machinery and road materials. Both of these associations are dominated by men of the highest character and ability. They have abundant leisure and unlimited resources. They have devoted much time and money to their propaganda. Every year they collect and expend many thousands of dollars to cultivate sentiment for "touring roads." They have found the fountains of publicity. Wherever a road convention or a road congress has been held they have been in it with delegates enough to dominate it—to fashion and form its resolutions. They have even been powerful enough to place before the country in an unfavorable light those who have opposed their plans. Yet, Mr. President, at the hazard of being called a "knight of the dirt roads," or a "pork-barrel Congressman," I will avail myself of this opportunity to reason with these "touring roads" advocates—to convince them that the first duty of Congress on this, as on every other subject, is to legislate in a practical way, in the interests of the general masses of the people.



Let us examine the "national roads" scheme.

There are in this country about 2,250,000 miles of roads. Every mile of these roads is a prime necessity to the people who live along it.

Mr. Charles Henry Davis, president of the National Highways Association, estimates that it would cost \$20,000 a mile to build "national roads." At that figure our entire road system of 2,250,000 miles would cost \$45,000,000,000. The human mind is paralyzed in contemplation of such an enormous sum. All the nations of the world could scarcely raise it.

To escape from such a situation the American Automobile Association and the National Highways Association propose that only a limited number of miles of "national roads" shall be built. Fifty thousand miles is the limit they suggest. This would leave 2,200,000 miles of roads unprovided for; and yet the people along these 2,200,000 miles of unprovided-for roads would be taxed to give these 50,000 miles of fancy "national roads" to favored communities and favored classes.

I hold in my hand a map of the United States showing the tentative location of these proposed 50,000 miles of "national roads." I can not take the time to analyze it as to all of the States. One or two will illustrate the whole scheme. Look at Ohio, for instance. One "national road" is laid along its northern boundary, through the counties of Ashtabula, Lake, Cuyahoga, Erie, Ottawa, and Lucas—7 counties. The other is laid across the center of the State through the counties of Belmont, Guernsey, Muskingum, Licking, Franklin, Madison, Clark, Montgomery, and Preble—9 counties. All told, these "national roads" in Ohio would touch only 16 counties and leave wholly untouched 72 counties. Yet to give "national roads" to these favored 16 counties the other 72 untouched counties would be taxed. The entire mileage of these two "national roads" through Ohio would not be much more than the mileage of improved roads which Hardin and Auglaize Counties have already built for themselves; but the enterprising people of these two counties would be taxed to build these "touring roads," over which the rank and file of them would never travel or haul a bushel of wheat in a lifetime.

Let us take another State, Alabama. This "national roads" map lays one of these "touring roads" through the counties of Dekalb, Etowah, St. Clair, Jefferson, Tuscaloosa, Green, and Sumpter—7 counties. Another passes through Cleburne, Calhoun, Bibb, Marengo, Clarke, Washington, and Mobile—8 counties. In the whole State of Alabama 15 counties are touched by these expensive highways and 52 counties are left wholly untouched. Yet these 52 untouched counties must be taxed to build luxurious roads through these favored 15 counties. After these untouched counties have paid this tax they may then build themselves some roads if they have any money left. These proposed high-class "national roads" through Alabama would not aggregate more than

400 or 500 miles. Montgomery County alone has built more than that many miles of improved roads. Yet her wide-awake people would be called upon to help pay for these "joy rider" roads, which would be too far away to ever be used by them.

Let us look at these 50,000 miles of proposed "national roads" from another angle. I recently read a paper by Mr. Charles Henry Davis, president of the National Roads Association, in which I find this statement: "Fifty thousand miles of national roads at \$20,000 a mile would cost a billion dollars."

Now, the federal government will not likely expend more than \$25,000,000 a year on roads. At that rate it would require 40 years to complete the proposed 50,000 miles. Long before that time shall have elapsed most of us will have died and gone to judgment. What we want is roads while we live.

But Mr. Davis proposes that having once adopted the policy the Government would proceed to build one road at a time. In that event some States would be reached the first year and others not until the end of forty years. Which would be the first lucky State? which the last unlucky one?

Mr. President and Gentlemen, don't you see that this "national-roads" scheme is a dismal delusion?

Now, just a word or two in relation to the other scheme for getting "touring roads"—that of having the federal government and the States jointly construct a limited mileage of high-class "across-country" highways.

The most concrete presentation I have seen of this plan is a bill now pending in Congress. I have not the time to analyze it in detail now. I shall content myself with calling attention to its two most salient features. As I said a moment ago, the "touring-roads" class desire to get as far as possible away from local control. To accomplish this the bill to which I refer provides that a new office shall be created—that of public-highway commissioner—who shall keep his office at Washington, where he may not be influenced nor even impressed by the yearnings of the people among whom the roads should radiate. Then, "to make assurance double sure," the bill carries this further provision: "*Provided, That all questions as to the location, method of construction, and maintenance shall be finally determined by the commissioner of public highways.*"

If such a provision as that shall ever be written into the Federal law, then, indeed, will the "joy rider" reign supreme.

Mr. President, it is not a road, nor yet a few roads that we want. What we must have is a general system of good roads extending throughout the length and breadth of the land.

I hold in my hand a pamphlet issued by the National Roads Association.

On one page of this pamphlet is a picture of a rocky, muddy, impassable road. Beneath the picture in bold type is printed the words: "Poor roads—poor schools—ignorance—poverty."



On the same page is another picture—a picture of a good road under which, in equally bold type, is printed the words: “Good roads—good schools—knowledge—prosperity.”

That is a pertinent illustration. According to this pamphlet, where good roads are there will be good schools, knowledge, and prosperity, while along bad roads poor schools, ignorance, and poverty will prevail. Yet this pamphlet advocates devoting 40 years to improve 2 per cent of the roads, leaving the people along the other 98 per cent groping in ignorance and poverty. Even worse than that, the National Roads Association proposes that the people along the 98 per cent of the roads who are thus to be left forty years wandering in the wilderness of poor roads, must help pay the costs of the 2 per cent of the roads which the American Automobile Association and the National Roads Association would build to the end that the rich automobile owners may “see America first.”

Abraham Lincoln once said, “This country can not exist half slave and half free.” Paraphrasing that lofty utterance I say this country can not exist 2 per cent enlightened and 98 per cent ignorant—2 per cent good roads and 98 per cent bad.

Mr. President, another fundamental error into which aristocratic classes fall is that there is no official wisdom and capacity except in federal officers. Why may not a State officer possess wisdom, capacity, and devotion to duty to the same extent as a federal functionary? Suppose you should create the office of public highway commissioner as asked for by the “touring roads” advocates. Where will you get a man to fill the office? Will Jupiter detail Mercury to bring us one from the ethereal realms above? No. You will have to take some citizen from some State, educated and trained in some State college. Can not the States get the same kind of men? Indeed, have not many of them already provided themselves with the best talent in the land?

Oh, you say the States have been slow to grapple with the road problem. Sir, how much slower have the States been in this respect than has been the federal government?

The States have not been slow in dealing with roads. On the contrary, they have made great progress, considering the difficulties they have had to meet.

“Touring roads” gentlemen beam with enthusiasm as they tell us of the good roads of France over which they have traveled. Why do not they go to the trouble to inform themselves of the fact that there are more miles of good roads in this country than there are in France. Every mile of these roads has been built by the States without either financial or engineering assistance from the federal government.

Before the “touring roads” advocates berate the States for being tardy in road building let them consider the surrounding facts.

The rapid changes which have taken place in the character of road vehicles and the method of their propulsion has thrown even the engineering world into confusion as to what should be the character

of road construction to meet the demands of traffic. Roads which were sufficient for the uses to which they were put a decade ago are wholly inadequate for the traffic of the present day.

Again, most of the States are hampered by archaic constitutions which prevent them from levying as much road tax as their people would cheerfully pay. It takes time to amend constitutions. However, they are doing it with much celerity.

Until recently few of the States had provided themselves with adequate highway departments. In another year or two very few will be without them. Already some of the best administrative and engineering talent of the country has been secured by State highway departments.

Road construction and road maintenance involves many mechanical and financial difficulties. Differences of climate, kinds of road material at hand, volume of traffic, and available road funds will require much variety in road construction and upkeep. These are problems for the States and their civil sub-divisions. Roads are local affairs, and their control should remain with the States and the people in whose midst they are. The federal government should not invade this domain. Any federal legislation which should in the slightest degree tend to belittle or discount States or State highway departments would be reactionary in the extreme.

Where the States construct and maintain roads of such degree of perfection as to supply the federal government with highways over which to perform its functions with reasonable facility, then it should contribute to their upkeep.

Of course, the federal government should see to it that it is not overreached in these expenditures. Congress should provide general standards of roads for which contribution would be made. The government could then protect itself by inspection and a refusal to make payment for any road falling below specified standards. Such a system would not require much federal machinery to administer it.

Mr. President, I fully realize that I am not in entire harmony with the dominant spirit of this great roads congress. I am conscious that a majority of the delegates here are members either of the American Automobile Association, the National Roads Association, or some other organization affiliated with one of these. You, gentlemen, are seeking to promote the construction and maintenance of a limited mileage of excellent highways, while I am seeking to secure the construction and maintenance of a general system of good roads. You believe that a few very high-class boulevards stretched across the continent would serve as object lessons to the people generally. On the other hand, it is my opinion that if we should succeed in securing a general system of average roads they would be maintained in such manner that in a few years they would grow into high-class roads. You want 50,000 miles of expensive "touring roads" to be built in forty years. I want 1,000,000 miles of "business and post roads" to be built in five years.



Now, gentlemen, I know you are just as conscientious and public spirited as I am, and it is that consciousness which moves me to conclude my remarks in an appeal to you to withdraw your opposition to a plain people's plan, which we desire to pass through Congress at the next session.

Our plan will be a modest one. It will not be expensive, and a vast majority of the people favor it. Get out of the way and let us try it out. If it fails, then we can take up one of your more ambitious schemes.

In the last Congress we passed through the House a bill providing a yearly contribution to each mile of roads in the States which should be constructed and maintained according to specified standards. Although vigorously opposed, this bill passed the House by a vote of 240 to 86. It failed in the Senate, however. I am informed that the American Automobile Association claims the credit of its defeat. How that was accomplished has not been revealed.

Had that bill become a law it is my candid opinion that within one year it would have given us 50,000 miles of improved roads and in five years would have given us a million miles.

As a warrant for this expression of opinion let me cite some facts.

Last winter the legislature of Missouri passed a bill modeled after ours, providing that every mile of road in the State leading from county seat to county seat which should be built up to specified standards should receive aid from the State to the extent of \$15 a mile. The State highway commissioner, who was charged with the duty of administering this law, refused to accept any road which was not 40 feet wide between fences, 30 feet wide between side ditches, so graded and crowned as to quickly shed water into side ditches, and provided with all necessary culverts, to be of stone or concrete. These are rather hard specifications. Yet that law has been in operation in Missouri only about six months, and 6,000 miles have been accepted by the State highway commissioner as having been brought within the provisions of the law. In many cases where public funds were not available, money, labor, and material were contributed by private persons. Within a year this \$15 a mile stimulus will have given the people of Missouri 10,000 miles of good roads. Had the same thing been done in the other of the 48 States a single year would have given us 480,000 miles of good roads.

Recurring again to Missouri, Governor Major, by public proclamation, set apart August 20 and 21 as road days, upon which he requested all able-bodied men to work the roads. Two hundred and fifty thousand men responded, and it is estimated that in labor and material there was more than a million dollars put upon the roads of Missouri during those two days. Later the governor of Arkansas issued a similar proclamation with similar results.

These facts warrant me in feeling that if the federal government would stimulate the road movement by a very modest aid per mile of improved roads astonishing results would follow.

Another lesson to be drawn from the facts which I have just cited from Missouri and Arkansas is that the States, the counties, and the people can be stirred to action, and that it would be unwise to take away from them the control of their roads and transfer it to Washington.

Mr. President, I repeat that if only moderate encouragement by the United States is given to the States and local authorities we shall in five years have a million miles of good roads—roads over which you gentlemen may in comfort tour any part of this great country of ours.

Won't you "come over and help us?"

THE CHAIRMAN: I am sure, gentlemen, it is a very great pleasure to us all to listen to Judge Shackelford, to listen to his able address. I know to us motorists, especially the poor ones, like myself, it is very pleasing to be put in the plutocratic class. After having hard work to pay my office rent in Buffalo and take a day or two off, I love to close my eyes as he talks and see myself swimming in millions and revelling in luxury and splendor. However, the practical training I have had makes it very difficult for me, when I take my lead pencil and revert back to the mathematics they taught me before I practiced engineering, to figure out how, if it takes forty years to build 50,000 miles of roads, you can build 1,000,000 miles of roads in five years. That is something like the problem, "Why is a hen?" and while, of course, I am not going to take any time here in debate, because I am only supposed to introduce the speakers, I do not want Judge Shackelford to go away with the idea that we want to build 2 per cent of the roads and let the other 98 per cent go. The federal government can care for 2 per cent and the State and county and township to care for the other 98 per cent, and they can do it far better when they have their trunk lines built.

I would also call your attention to the fact that you cannot build a business road without building a motor road. The motorists will go where the roads are built and if they are crowded with farmers, so much the better. The day before yesterday I took the Judge from Buffalo to Niagara Falls in my automobile over a road that the State has built and over which the farmers bring 15,000 tons of produce to market from the grandest fruit country in the world. Then we went to Niagara Falls. It was the first time the Judge had seen it and we showed him the power development, which takes one-seventh of the water, and he says: "That's the best part of it, in time those Falls will run dry; you fellows with your aesthetic ideas are all wrong; commercialism will rule this country. It is wise that every bit of the water should be for commercial purposes and we poor farmers will then get the benefit of that water." Then I took him to Goat Island and showed him the trees and shrubbery and told him that every form of growth in the State of New York is represented on Goat Island; it is in its virgin state, has never



been touched. He said, "It's grand, it never should be touched, it should be left just as it is." I said, "No, Judge, we will have to cut down the trees and make lead pencils of them."

Then we came up the Canadian shore—on the American shore we can't go along the river; it is teeming with factories, with commercial development—but on the Canadian side there is a strip of 100 feet wide, and we went along the river's edge from one end to the other, and the Judge forgot himself for a moment and said, "This is grand, they are away head of us on this side."

I want to say that the real test of the right way of building roads is to actually put it into practice. In the State of New York, in 1895, there was appropriated \$50,000,000 for building State roads, constituting 10 per cent of the total mileage, 4 per cent State mileage, 6 per cent county mileage, leaving 90 per cent untouched. After they spent that \$50,000,000, the people were asked to vote on another road proposition. There were counties in which there wasn't a mile of road built or proposed to be built, of these main highways, but what was the result? The second \$50,000,000 was carried by a bigger vote than the first; there wasn't a township or highway district or county in the State that didn't vote in favor of it and by an increased majority over what they had voted for the first \$50,000,000 appropriation in 1895, which showed what the people wanted. It showed that when we build the main highways, the local people will care for the local highways. In New York State it was possible to pass that \$100,000,000 appropriation, partly because we had such meetings as these.

When you people go home, you meet a few constituents, but we would be entirely lost without the great press of the United States. It is the newspapers of this country who are more responsible for the good roads movement than any other source, and of the newspapers there was one man in New York State twenty years ago who had the keenness of perception to see what the road problem meant in this country and fight for good roads, and that man has fought for good roads from that day to this and he is here today, and it gives me great pleasure to introduce the proprietor of the *Evening News* of Buffalo, the greatest good roads daily in the United States, the Hon. Edward H. Butler.

#### ADDRESS BY EDWARD H. BUTLER

I did not expect to meet such a strong advocate for letting everything alone in the way of federal aid as Judge Shackleford. I have heard of him and know what he is capable of. He is one of the ablest opponents we have and we will have to watch him when he gets back to Congress.

But first of all, I want to call your attention to something that happened in New York last night. The newspapers of Detroit, to which my good friend, Mr. Diehl, pays tribute, contained the news this

morning of the sad fate of Lieutenant-Governor Woodruff, of New York. He has been a strong good roads man and pike man, and it was by reason of the interest that he took in good roads that we have sidewalks along the farms made of cinders, by which the automobilists could find safe journey to the next town, and that and other things for which he was famous made him lieutenant-governor of our State.

I move you, Mr. Chairman, that a resolution of condolence and sympathy be sent today as the expression of this convention, to Mr. Woodruff. He is not in immediate danger. The 'phone tells me that he is resting easily, but will never recover the use of his side, and it may terminate fatally within twenty-four hours. He addressed the Association for National Good Roads four years ago in Chicago.

I spoke on that occasion and made a prediction which is verified here today, that it would be four years more before you had them. I do not want to say that, with the strong, strenuous opposition of Judge Shackelford, it will be another four years, because now that we know him and know what we have got to contend with, we will get busy.

I have heard the term "de luxe" used inadvertently here two or three times, and "wealthy aristocrat," in connection with good roads. Now, does anyone think for one minute how much money is spent for labor in making these automobiles for the "leisurely rich?" I do my share in buying them. I have the largest number of private automobiles registered at Albany of any man in my State, and still I am looking for another. If something new comes on the market, we get it.

Now, we want to speak about what we did in New York State. There was a lot of highway money wasted. Governor Sulzer came in and said, "Gentlemen, you have got to spend every dollar honestly in the construction of these roads and I will put men in to make you do it," and he selected Mr. Diehl from our end of the State. We knew him, we knew his worthy father, who had been mayor twice, and refused, almost at the point of the bayonet, to accept another nomination.

The engineer had more than he could do in the private practice, yet he yielded to the public call. They asked him, "Don't you owe something to the State? We know you are honest and will trust that you are not ignorant." Immediately, Governor Sulzer became the target of the rabble that couldn't get a contract to do nothing and draw money, and the result is, they are trying to crucify him now. That was the inception of the whole business. We can't do this thing of building good roads honestly by States alone, Judge Shackelford notwithstanding. Look at the State of New York and the money that was squandered. Half the stuff they put down this year would be over in the fields next year.



We want federal inspection and control. Let the inspection start with the trunk lines and the others will follow. I go through Europe every year in my automobile and hope I will do so as long as I live. This year I can't go on account of this meeting. I have seen the trunk lines, I have seen the lateral roads left unfinished, but they have brains enough to get over on the trunk line and go to the nearest town. We cannot do everything at once.

I was one of the committee, being a member of the Waterways Congress, who went to see Uncle Joe Cannon, who lives not far from here and who is going to run again. He raised both hands and said "\$6,000,000—great God! Where would you get it?" The next day he knew, when the governor of Alabama got on that platform, succeeding Mr. Taft, and said, "If anyone gets in the way of your doing what you should do for the people, throw him off;" then Uncle Joe saw a new light; he didn't hand us out the \$6,000,000, but he wasn't so reluctant as he had been the day before, and the wonder where it was to come from never happened to enter his breast. He said, "If they want it, I don't care; it's the people's money."

Don't be so sparing of the federal money; go ahead, let Congress do something; let it begin and we will take care of the other, and these leisurely rich. How many rich men are there who own automobiles compared with the poor man? Mr. Ford—and I am willing to give him the benefit of this advertising—said he was going to build 300,000 automobiles next year here in Detroit. What does that mean? Are there three hundred and odd thousand rich men ready to buy that Ford? No, they will go to the poor man, and the farmer and the farmer's daughter and to the farmer's son, and his grandchildren; they will be running those Fords, because they cannot afford to buy a more costly machine. Don't you think they are interested in this as well as the five or ten thousand leisurely rich?

Mr. Enos, the head of one of our great Buffalo institutions, is a man of large affairs, a manufacturer employing thousands of men, a rich man, and he is doing more to help the poor man than any poor man has ever done. Now, that is the truth. Mr. Diehl, to my own positive knowledge, because I talked it over with Mr. Argyle, didn't want to become associated with good roads; he had more than he could do in his private practice. There's a lot of new building going on down our way. We are not inspired by the success in the manufacture of automobiles here in Detroit, but we are doing very well.

You passed us in population because we were asleep; we were afraid the federal government would do something to help us along, but we have better roads than you have here. I don't want to say that I know all about the roads in Europe, but I want to see the roads I don't know about in Europe. Why, just think of it, Appius Claudius built a road between Rome and Naples 300 years B.C. and



that road is better today than this road from here to Jackson that was built two years ago.

That is contractors' graft; that's what I mean. It is not that our States cannot do it, but they won't let them do it; the politicians have got it in their hands; you have to go down and grab anything back from them. We have had it. Some of them are going to jail for it, too. Let the federal government help us all they can. I use the collective noun in the plural, "they," because the government is comprised of eight or nine strong men like Brother Shackleford and some others. They will let him go on and the rest will sit back and say, "That's so."

I hate a "that's so" man. Get out and see what you can do for yourself. I haven't told you gentlemen a word that is untrue. I know how fast they are going to do this thing over in Missouri, but you will have to show me. My good friend, Colonel Nelson, of the *Kansas City Star*, than whom there are few better automobilists (I have been abroad with him and raced with him), is always telling us, "We are going to have that thing fixed within a few days; come up and see us." He spoke last night and told us how much we'd get up there and I am going up to see it. I am from Missouri now and the Colonel will have more excuses to offer about being more hampered by contractors or men who furnish materials than we are.

Now, gentlemen, I do not want to take up any more of your time. I might talk here on the European roads and tell you what you can get; so well were they advertised that the road leading all the way down to Naples was cut up with ridges, after that book, *The Lightning Conductor*, was circulated and told about the beauties of that trip. Millions of dollars every year are left there. I talked with Mr. Coliet, of the Automobile Club of France, of which I am a member, and he said, "We are going to get \$500,000,000 this year out of you Americans," and I guess they are.

I have a son down in the Italian Lakes with his wife now and he said, "I can't get through until the 23d of October," and he commenced September 8th. Why is that money left over there? There isn't a more beautiful tour in the world, more beautiful scenery, more alluring and everything, and nature has been generous to us, than the Hudson River country from New York to Albany, yet we hear all about the other side, go over to see it, come right back home. Of course, I am only furthering the argument of Mr. Shackleford when he said, "See your own country first." I am willing to if I can ride in an automobile without a spike, a blow-out or a puncture every 40 feet.

I do wish today that this Convention, composed at it is, of the smartest lot of men I have ever met in any convention—politicians are here, members of Congress are here, and the Southern Railway President, Mr. Finley, is here, though what he is doing in this company I don't know. Someone said down in Richmond that we'd leave the railroads out of business. Well, some of them ought to be left. When we get good roads down through that country they will be left.

I own a winter home in South Carolina and up at Columbia they got that far with the road that the *Atlanta Journal* and the *New York Herald* are promoting, but they don't get money enough to bring it on down and that road has been a failure. Now, if the federal government did what they should, they would give that poor, oppressed, ground-down southern country a lifting hand; that's what they should do. There are thousands of us, probably many through sentiment and others for climatic reasons, who would buy plantations en route to Atlanta. We'd stop over, entertain our friends and have model farms.

I have one in New York State—yes, we are a leisure-loving class, a de luxe class and all that, but going down there to our ranches over a decent road, what would be the result? That country would boom. We will put our money in there and help them along. We owe that southern country \$100,000,000 right now. I dare stand up as a Republican—and they recognize me in my party—and say that if we were in their shoes we would never get up in God's green world! No, sir! That country was devastated; everything was taken away; they were crushed down and left nothing. War is hell. Well, with them it was two hells, that's all there is to it.

I want to see the South get a little of this money, this federal aid; it's the least we can do. After we whipped them we went right in and despoiled them and we followed that up with our carpet baggers, sent down to annoy and tantalize that glorious people, and now, when they ask a little aid from the federal government, they should get it. I am ashamed to say that some of my people are opposed to it. Now, let the government do all they can and we will do the rest.

We know that we are going to have good roads around Buffalo and Niagara Falls. Why, Mr. Carlisle said I knew when he appointed Mr. Diehl the manager of this western part of the State, that things would come right, and they have come right. You can go to Niagara Falls now without getting out four times and having everybody get off the back seat—"Come ladies, got to get the jack."

It got to be so bad that we wouldn't go any more, and one cruel beast of a man said his wife was always running the front of the car from the back seat; she'd say, "That's right, John, run it right in that hole; I saw it from the back seat and you couldn't see it from the front; why don't you get out and ask somebody where we are?" Yet, I suppose, if it was to do over again, I'd marry her again. I told her so and she said, "I'll bet you ten dollars you wouldn't."

The ladies are always running cars. I bought one in Chicago, that everyone of my family can run. We can't meet every year and do nothing. I hope this Convention will be in favor of the federal aid plan. Let them start; if they go bankrupt we can put in a little and help them out, but I want to see something done that is tangible.



Mr. Diehl went up against the hardest proposition that you ever saw. We had been stolen blind and hadn't been able to catch the thief, but after he gave us good roads and saw that the material was there to mend the roads when they got holes in them, if we did feel plutocratic; we held our fingers and thumbs here and were the leisurely rich. If a market boy had a little Ford he could go over and assume the air of greatness if he had it not. I think it's an upbuilding proposition and the sooner we can get so we can go down South into that wonderful country and see our own country first, the better.

You can't see that country now unless you ride on Mr. Finley's railroad and that's a train de luxe that goes from New York to Florida and doesn't stop en route for poor people; the poor people have to take the freight trains. I think Detroit, with all it has done to promote touring, should get busy; come down and see Mr. Diehl or Mr. Enos and he will come up here and build more than thirteen miles of road in every direction out of Detroit; that's what they tell me they have.

He will put an electric light on a pole a mile high, so that you can see the mudhole. Get busy right here. This Convention will bring forth fruit, I am sure of it. Look at the price the gentleman (Mr. Shackelford) starts off with! The initial cost of brick is too much, but if he was thinking of the road Mr. Diehl builds, the road that will stay, he can do it for \$11,000 a mile, Mr. Davis, his authority, notwithstanding.

You know the old story that Joe Cannon told in one of his speeches about the young couple wanting to be married and they were looking at furniture and the fellow thought it was too high. He said, "Twenty years from now I can buy that dining room set for about two-thirds of the money." "But, Joe, in the meantime we have been missing a lot of fun."

Now, gentlemen, I am in favor of just one thing; Uncle Sam has the money and he has the disposition, and has nearly two-thirds of the people with him, so let him help on this road proposition; he can do it. Let him control it and let the others get in when they can. It is so in Europe; it certainly is in Germany, which is beginning now to go all over her roads.

The Kaiser belongs to that leisurely class, rich and plutocratic and something else. He goes over the roads and if things are bad he gets a jog and the secretary is always in front. "You get after the highway commissioner and tell him it's between 36 K and M," and he's out there by daylight with a gang of men fixing it. Somebody asked the Kaiser if he wouldn't take a ride in this country. He said, "No, sufficient unto me is the evil roads I have here."

But next year we will get it. The roads are carrying big wagons and all that. Do you know what this means to you people? In Chicago they are running automobile trucks with express to Milwaukee on account of the expensiveness or slowness of the express service. I had it up with their agent. It is about as bad down our



way; they are going to put in a trunk line between Rochester and Buffalo, 78 miles, over a beautiful road. They have been trying it for two years between Niagara Falls and Buffalo.

They tell me the railroads want to see these good roads; well, they have changed their tune if they do; I don't believe them; I don't believe they want it, but they will be in it, don't forget that; they will be with you, and if they can hold back any improvement on the road that foreshadows any degree of competition with them, look out for them. I thank you, gentlemen.

THE CHAIRMAN: There are men in Congress who do not take the same view of the road question as Judge Shackelford. In the delegation of 16 Congressmen from Missouri, all but one lean toward Judge Shackelford's view; the other man takes a contrary view. The mere fact that that one man is equal to his 15 colleagues from the State is a slight indication of his great ability. He is also known, and deservedly so, as being a silver-tongued orator, the most eloquent Congressman west of the Missouri. It is a pleasure to present the Hon. Wm. P. Borland, member of Congress, from Kansas City, Missouri.

#### ADDRESS BY HON. WM. P. BORLAND

##### *Member of Congress*

No man could live up to that introduction, so that I am not going to attempt to do so, but I am very glad to say that Missouri is fortunate in being represented here by two members of her delegation. That indicates the substantial interest that Missouri has in the cause of good roads. It is fortunate also in another respect, in that it may clear away from your minds some misapprehension that we have only one idea of roads out there in Missouri, and that is Judge Shackelford's idea. My congressional district is but one county, containing a city of a quarter of a million people and a very prosperous rural section, containing about 2200 farmers, about 6500 voters in the rural section; that county, Jackson county, contains 300 miles of the highest grade of improved rock roads with oil binder, that are passable 365 days out of the year, and no man can go out there into Jackson County, of all the counties in Missouri, and tell the farmers that we don't want a high grade of roads. People out there have learned by actual experience, so that we have taken a different view of it than is sometimes taken in other sections of Missouri. I find there are more automobiles—I don't own one myself and therefore I am not in this plutocratic class, but that is not due to any lack of inclination, that's my misfortune not my fault—but I find there are more automobiles owned by the farmers than by any other class of citizens in my District. They are not the high grade automobiles, they are not the expensive kind, but

they are automobiles suited to the country user. I heard about a man down in Judge Shackleford's district, 103 years old, and some fellow came out from New York City, looked this man up and wanted to engage him for a show, a museum. He went down there and found the old fellow and found it was all true; he was 103 years old, had a family Bible to prove it. The showman from New York said, "Well, I'll make a contract with you; I'll give you fifty dollars a week and expenses to come with the show." "Well," the old fellow said, "that sounds pretty good to me, but I can't close the deal with you right now. I've made a rule all my life not to close up a business deal without consulting Pa." The fellow says, "For the love of Heaven, where is your Pa?" He says, "He has gone down town to show Grandpa how to run his automobile." If I believed in the doctrine that Judge Shackleford has enunciated, of course I would be opposed to federal aid in any form, and I would not be here and this Convention would not be here. If this be purely a local enterprise and amply and thoroughly handled by local initiative, then there is no justification for federal aid in any form. If the uniformity, efficiency, economy, scientific perfection, utilization of advanced ideas of construction and maintenance, if, in other words, the reduction of things to a business basis, is not necessary, then there is no justification for our acting in larger bodies. We ought to go back and act solely in our small and local bodies. If I believed it was not to the national interest to spend a dollar in your road district, except the taxes that were collected in your road district, then there would be no justification for our meeting together. If it were not true that the great wealthy centers of population in this country stand ready and ought to stand ready to contribute to the development of the less developed sections of the country for the common prosperity of the whole nation, then there would be no basis for federal aid. If it were not true that a commercial metropolis of a State, like Kansas City and St. Louis, had a vital interest in the construction of highways and the development of Camden County or Morgan County or any county in Judge Shackleford's district, then that State would be committing a political crime if it undertook to meddle in the construction or maintenance of highways. But it is only because the concentrated wealth in New York City or in Detroit or in St. Louis, is the wealth that has been gathered in the last analysis from the farms, that it is right for the federal government or the State government or the large political power to lay its hands on that concentrated wealth and return it to the development of the original source from which the wealth came. If I agreed with Judge Shackleford that not a dollar should be spent in your little road district except what you yourselves raise, in other words, if I believe that the federal government ought not to be called upon to build a road in some other man's district, then I would believe it ought not to build a road in your district and we would get right back to the point that you could take out of the federal



treasury exactly every penny you put in and not a penny more. Under those circumstances, what would be the object in the federal government interfering in the matter at all? That is exactly the situation. If we are on that basis, we are on an entirely different basis from what we think we are. But I took for my text the words of the secretary of agriculture yesterday, "those who fear the power of the federal government had better take counsel of their fears before they approach the federal treasury." For you gentlemen have every dollar in your road district of taxable wealth that belongs to you, and if you want to keep it there, if you want to fence yourself off from the rest of the world, if you want to dig a moat around a parapeted castle so that we cannot break in, you have no basis on which you can appeal to the federal government at all. This matter of good roads is engaging public attention on a scientific and businesslike basis for the first time, practically for the first time, in the history of our country. There never has been such general and widespread interest in good roads. It indicates that there is some insistent, natural and well-justified public demand for a solution of this problem, and that is reflected in Congress. There are many men who are willing to shout enthusiastically and talk glittering generalities about the improvement of roads, but there are mighty few men, in or out of Congress, and I can say with certainty there are mighty few men in Congress, that have the boldness to grasp the necessary factors of the situation. For a hundred and fifty years or more, in this country we have been pursuing the plan of building and maintaining highways, the great arteries of the nation, by means of isolated local control. We inherited that system from England, from which we inherited our other political institutions, but we inherited that system at a time when England was a hermit nation, with her forests full of outlaws, when 99 out of 100 of her young men went abroad for their education, when she had not a manufactory or a large city in her entire limits. We have attempted to adapt that feudal system of the little road district to a great nation three thousand miles in extent, that had to be carved out of the native wilderness. We have attempted to cling to that system of isolated local control of the construction and maintenance of roads, when the mother country herself has for more than a hundred years abandoned it and when no other civilized nation on earth ever adopted it. There are inherent weaknesses in the system of local control, natural and inherent. One is that the road districts vary in size, they vary in taxable wealth, they vary in their location to their neighbors and to the general community, and, more than all, they vary in their legal powers. Those of us who have tried to do anything along the line of good roads from a practical standpoint, beyond shouting with the crowd occasionally, have found that the whole subject of road laws is a legal jungle, almost impenetrable, overlapped with the accumulation of ages, choked with briars and underbrush and fallen timber. Those of us who have tried



to penetrate it in any direction have had the usual reward of pioneers to get our hands and faces scratched and torn until they bled, and that has been about the only result so far. Any lawyer will tell you that the road laws of any State in the Union are in chaos. There is not uniformity even in the laws of the individual State as to the local powers of the road districts themselves. There is not a road district in a State in the Union that has a clean-cut knowledge of the extent and definition of its own power. The road districts vary in taxable wealth. Why, it almost invariably happens that the road district with the largest taxable wealth has the fewest road problems. It has a rich, level country near a popular city, where its road problems are few, and the road district with the smallest taxable wealth has the rough country and the difficult road problems, and yet we expect those two districts to maintain a spirit of independence, almost of hostility, towards each other, for fear that there might be some coöperation that would lead to the improvement of the general highway. If that kind of coöperation is necessary between the road districts or townships of a county, if it is necessary between the counties of a State, it is necessary between the States of the Union. I had an idea when I first approached this problem, because I had had some little to do with city government, had drafted the charter of Kansas City as a member of its board of freeholders, and had had some little to do with the city government itself—I had an idea that the way the roads ought to be built was to have them built by the man who owned the abutting land on the road. It appeared perfectly clear that if the city, as most cities do, required the local street to be constructed, and in many cases maintained, by the property owner, that the same rule must apply to the country property owner. I assumed that if that were true, that the construction of a high grade street in a city along a certain block, raises the value of the adjoining property, until the cost is completely absorbed in the advanced price of the property abutting on it, that that same principle would apply in country roads. It took me some time to find out why I had any interest in the roads in Judge Shackelford's district. I discovered, in getting a little deeper into this proposition, that the value of city property consisted solely in its accessibility. You want property in a city because it is located advantageously, because it is accessible and surrounded by the city improvements, but the value of farm lands depends upon the amount of crops per acre that you can raise on the farm. If you have got a good, well-located city lot, there is no limit but the blue sky to the value, to the price you can get out of that by the accumulation of business in your neighborhood. Your farm land cannot retain upon itself the wealth it produces; if it did it would be useless to the owner and to humanity, but the farm land must send the greater portion of its wealth to the city, and we in the city do business upon the wealth that comes in from the farm, and that basis alone is the only honest and ethical basis on which coöperation must be compelled between

the city man and the country man in the construction of the great highways of commerce. Now, under those circumstances, gentlemen, I have no desire, from the standpoint of a man who represents both a city and a country constituency, to either kick the city man in the face nor trample upon the country man; it is a question of honest coöperation. I don't believe that the city man should have his property laid upon by the strong hand of the law to hand over to the one-gallus fellow that don't fix his road down in the country. In fact, I don't believe in this vanishing illusion of the one-gallus farmer; there isn't any one-gallus farmer left in my part of Missouri, and I trust in a few years there won't be any one-gallus farmers left in any part of Missouri. If that principle applies to the State of Missouri, (and it is the only honest principle on which we can justify a State tax for roads), if that applies to the State of Missouri, that the accumulated wealth of the farms of Missouri is what makes the commercial metropolis of Kansas City and St. Louis, and therefore it is right for the great State of Missouri to lay its hands on the taxable wealth accumulated in St. Louis and Kansas City and return a portion of it to the source from which it came—if that is true in the case of the state, it is true in the case of the nation. Now, that principle seems to me immutable. You cannot keep the wealth of the farm on the farm and if you did the cities would starve to death. You cannot keep the wealth of the city in the city, you must transact your business in the city with the growing wealth that comes from the country, and the same is true of the nation. Here is the great City of New York, so ably represented by these broadminded men who have spoken to you. I am glad they are, because I want to tell you that I was born and raised and have grown to political and to professional manhood, out in the Missouri Valley, the great granary of the country, and I have always had the belief and still cherish it, that if we were to cut off the means of transportation across the Allegheny Mountains, New York would be in danger of starving to death in thirty days. I have heard some men from New York get up and say, "Why should the nation lay its hands upon the wealth accumulated in the City of New York and build roads in Missouri and Montana?" And I tell them that the principle is precisely the same, that they lay hands upon the wealth of Buffalo and New York City to build roads in the interior counties of New York. The wealth that is centered in the great, glittering metropolis of this wealthy nation of ours, was not produced upon the barren streets and squares of the metropolis; it came from the rural sections, and the more of it that comes from the rural sections, the greater will New York be. New York is our metropolis, it is our great gateway to the world, it is our great export market. It draws its wealth from all the nations. Great railroads run through Missouri, but their general offices are located and their bonds are owned in New York. It is true, we pay life insurance in Missouri, but we send the check back to New York, and then borrow



it back again to get a mortgage on our farms. It is true, we have banks in Missouri, but we send our reserves to New York. It is true, we raise the crops in Missouri, but we ship them to New York, and New York will no more divorce herself from Missouri and Montana than Montana and Missouri can divorce themselves from New York. We are one great nation, and if we justify ourselves in federal aid to roads, on the theory that we are on a dishonest basis, if there be any danger in federal control, let your little road district run it to suit itself; then it will be perfectly safe and have its money in its own hands. If I believed that, I would vote against the improvement of every navigable river and every harbor in the United States. I live at the furthest end of navigable water in the United States, at the great place where the Missouri River bends to the northward and spreads out to the great northwest, the country that has no navigation. I have been working, since my service began in Congress for the navigation of the Missouri River. This year, for the first time, we had a fleet of seven boats running all the seasons, because we had the banks revetted and had no sand bar. We have got the water, the channel and the boats, and I have combatted this same idea among my Kansas and Nebraska and Colorado colleagues, who say, "The Missouri River don't touch us," and I say, "The nearer I can get it to your wheat fields the cheaper you can get your wheat on the market." If I believed in that doctrine of isolated local control, I would be compelled to vote, not against the improvement of the Missouri River, which runs by my door, but against all the rivers that did not run by my door; against the improvement of Gasconade and Osage, that run solely through Judge Shackelford's district. They are tributaries of the Missouri, but the freight they haul, by virtue of the improvements thereon by the federal government, is a part of the great wealth of the Commonwealth of Missouri. No, we cannot divorce ourselves, gentlemen, we are here as a great nation and here to cooperate. I am not a touring man nor an automobile owner, directly or indirectly. I welcome to this movement in favor of good roads every element, every class, if it chooses to call itself a class, though I don't recognize classes. I recognize every class of citizens who are willing to aid in pushing forward a common object in which we are all interested. I have no desire to kick any class or interest in the face. As long as we are going along in the same direction, we ought all to pull together as far as we can. Now, the question of federal aid has assumed a critical point in the history of our government. We voted, as you recall, at one time, to pay \$15 a mile for dirt roads, \$20 a mile for gravel and sand roads, \$25 a mile for rock roads for carrying the mail over those roads of ours. That was a mere pretence; those of us who voted for that proposition, who didn't believe in it, voted for it on the ground that it was a declaration of the principle of federal aid and on no other ground. We knew that \$15 a mile did not amount to anything, either in the construction or the maintenance of those roads. They



might possibly maintain a dirt road after a fashion, but, of course, we understood, as you understand, that a dirt road is the highest priced road to maintain and an improved road is the cheapest in the long run. It's like the difference between a wood and tin bridge and a stone arch bridge. Out in our country the commissioners used to be very fond of putting up what we call tin bridges, these rattling iron structures that rattle themselves to pieces in a few years. We had the wooden bridge idea first, then the tin bridge, and now we have got clear past it and have quit wasting our money that way. Men will quit wasting their money on unimproved roads when they see that they are no better off this spring than last and no better off this year than a hundred years ago. I believe in the higher type of road, in the better class of road, and I won't vote for any federal appropriation that does not promise the people, not a division of the federal money into a pork barrel in every congressional district, but a scientific, permanent, better class of roads than we have today. Now, mark you, my friends, I've got 300 miles of fine roads in my county, the best class of roads that are mentioned in that road bill that went through the lower House of Congress. Twenty-five dollars a mile was the price that was going to be paid. I would have taken that home to my people, \$7500 out of the federal treasury, the amount of my annual salary as congressman, taken off my coat, unbuttoned my collar, and got out on a hot day and told the people, "I brought back \$7500 of federal money." Some might have been interested in that, but lots of them would have looked on me with a good deal of pity. "What do we want with \$7500 of federal money, when our county is spending between \$500,000 and \$600,000 every year? We don't want your \$7500 and if you are a pork barrel Congressman we don't want you." That is the way the business men in my district would have acted. They would have said "If you don't go down there and solve that road problem, we don't want you tackling it at all; let it alone." We spend half a million dollars in that county on roads now and although I would have gotten the biggest sum of money out of that bill of any congressman in the State of Missouri, I would not have dared to offer it to my people. Last session we created a committee on roads; that shows that the interest is gaining ground. In the post-office and post-roads bill they put an appropriation of \$500,000 to be expended, as the secretary of agriculture told you, by him and the postmaster general jointly. That was to be spent in coöperation with the State, the State contributing twice as much as the federal government. The fact that it resulted in a glittering failure was not the fault of the secretary of agriculture or the postmaster general or the spirit in which they approached it, for no man could have approached it with more sympathetic diligence than those two. They were facing difficulties; they found that \$500,000 divided among the States equally would mean about \$10,000 for a State. Then they sent out word to the governors of the forty-eight States and asked them

to select a road and to contribute \$20,000 from the State funds or the local funds to the improvement of that section of road. Of the forty-eight governors who were invited to select, only twelve undertook to do so. I don't know how many they actually heard from, but those that didn't undertake to select their roads said it was because their State constitutions or laws of their State were in such condition that they could not coöperate with anybody on any subject and it was useless to talk to them until they had a reform in their local procedure. Twelve governors undertook to designate roads, among them the governor of my own State of Missouri, who designated a stretch of road and had the nerve to go contrary to somebody's opinion here, because he designated a portion of the cross-State highway in the county of Lafayette, adjoining my county of Jackson on the east, a smaller and less wealthy county. He designated that little strip of road there. I don't know what was the matter, whether those road districts had exhausted their taxing power or their local powers were insufficient, but for some reason or other, that \$10,000 lay there for sixteen months and Lafayette County was unable to take it. After it had laid there a reasonable time, the federal government withdrew it, and so we did not get any \$10,000 at all. Then we found there were only three States in the Union that could take advantage of that contributory offer—Alabama, Mississippi and Oregon; all the other forty-five States were compelled to refuse it. This gets right back to your State duties, which are just as necessary as the duties of the federal government. Then these officers, in their wisdom, still intending to carry out the spirit, if not the letter of the law of Congress, selected, arbitrarily, certain roads in the United States to be improved with the balance of the money. They selected one in Iowa, that is the nearest to me, in the northern part of Iowa. That information is valuable from this standpoint, that it throws a strong ray of light into this legal jungle that must be cleared away. We have got to put our axe right at the root of the tree, get right down to the place where the secretary of agriculture says the federal government can deal only with the State as a unit, then let the State perform the high function of a State to deal with its counties and local districts, and there comes in the preservation of the dignity and power of the State, but when those roads have been selected and are to be improved by the federal and State government, the initiative, the secretary says, should be with the authorities of the State and should be submitted, also, to the federal government. I am not one of those who fear the action of the federal government or are willing to take the federal government's money without allowing it a joint supervision over the expenditure of the money. I see no objection to this whatever. One of the most vicious things, one of the most dangerous things, to the cause of good roads in this country was the pork barrel idea that we will put our hands into



the federal treasury, take out as much as we can hold in both hands, take it back to our congressional districts and say, "Here, this money comes from the federal government, there's no strings tied to it, you can do with it as you please." That kind of a proposition would be the greatest detriment and setback to the cause of good roads that could possibly be imagined, in my judgment. No, if you are going to have good roads in this country, we need not talk about good roads, that's a matter of opinion; if you are going to have *better* roads in this country (that is the word I like), a higher grade of roads; if we are going to employ the scientific research of this office of public roads that Mr. Page heads; if we are going to make use of the money the federal government has already expended in acquiring scientific knowledge about road material and drainage and engineering and construction of drainage and the proper kinds of soil; if we are going to get that knowledge that has been acquired at public expense to put into the hands of the people, then we have got to have some form of federal aid by which there will be an active coöperation between the officials of the federal government and the local district. You cannot expect the officials of the local district to have within their power or financial reach all the technical knowledge that is resting unused in the archives of the bureau of roads at Washington, and that information belongs to you, it was paid for with your money. But if you want to build a Chinese wall around your road district, let your little road boss find out for himself what are the scientific requirements for maintaining permanently and efficiently good roads in your neighborhood. We want better roads and the only way to get them is to get economy and efficiency in the management. This road convention is a convention of business men. If you believed that your road district was solving the problem, you would not be here, not a man of you; you are business men and if you believed that the road district ought to solve the problem, not a man of you would have been here. You believe that the problem is too big for any one road district and that the wealth of the nation tends to accumulate in the cities of the nation, in the centers of population, and you desire, very properly, that a part of that wealth that accumulates there, the original product of the farm, shall be returned to the source of the wealth, the country, for the development of the country and the city and make this a greater, grander and richer nation and a nation of intelligence, a nation of high social activity, a nation of high development, a nation of good schools, a nation of good churches, a nation where country life is just as comfortable and just as social and just as attractive as city life; then, when you have done all of that, you will find that the old Stars and Stripes will wave from ocean to ocean, over the grandest, best civilization that the world has ever seen. I thank you.



THE CHAIRMAN: The next speaker is the chairman of the legislative committee of the American Automobile Association. We feel that we have one of the best lawyers in the country representing us and it is a pleasure to introduce the Hon. Charles Thaddeus Terry.

### ADDRESS BY CHARLES T. TERRY

As I look into your faces I know it is an audience which is familiar with the historical incidents of the Bible. I am going to refer you to one of them. You know the story of Jonah and the whale, but probably you have never come across the full account of it. It you have, you have read that prior to the cataclysm which restored Jonah back to terra firma, the whale said to him, "I have inside information of the proposition that there is something which I must get out of my system." And accordingly, Jonah was raised a "perfectly good man," but as he lay upon the beach where he had been cast, you will realize that he had suffered some damage and was not exactly in the best condition; and accordingly help was called and a physician approaching him, stood in a brown study looking at him, and Jonah partially came to and looked up at the physician and said, "Are you a doctor?" The physician said, "I am." "Well," said he, "why don't you do something for me?" "Well," said the doctor, "there are seven methods of first aid to the injured and I am trying to think which one to apply." And Jonah said, "Is there anything in any of them about whiskey?" He said, "Yes, that is an ingredient in one of them." "Well," Jonah said, "forget the others." Now, we have had this matter of good roads and federal aid for roads in our system for a long while. I submit to you, Ladies and Gentlemen, that it is about time we got rid of it. We have talked, we have had a superabundance of superheated atmosphere about it and it is about time that there was some action; it is about time that the talk ripened into some concrete thing. If it does not ripen it will rot. We must eventually apply some one remedy and forget the others. Now, there are various and sundry suggestions of various and sundry ways of producing federal aid for good roads. Mr. Shackleford has a theory; Mr. Borland has another one, which is a little different, and A, B, C and D each has a particular pet theory. I asked somebody on an occasion what he thought of Mr. Shackleford's plan, and he said, "I like it." "Have you heard of any other plans?" "Yes." "What do you think of them?" "I like them." "Well, what is your idea of what a national system of good roads should do?" "Why," he said, "I only have one requirement for a national system of good roads and that is that it shall build a road in front of my door." Now, the issue is between selfishness and provincialism on the one hand and a broad liberality and nationalism on the other hand. A house divided against itself certainly will not stand. I have

heard no one in the last six or seven years, during which this question has been mooted, who is not for good roads, heartily for them, and who is not for federal aid to good roads, and the question only remains now, "What shall be the method, how shall the technical feature of it be worked out? What plans shall be followed? How shall federal moneys be applied to the improvement of the highways of the nation?" You will recall that a celebrated ex-president of this country has a daughter who sometimes indulges in amusement, not wisely, but too well, and who, sitting in one of the galleries in one of the halls of Congress, to which resort was had from time to time by various members of the House of Representatives, put a tack on the seat next to her, and one of the Congressmen, taking the seat presently, was moved to sudden action, and she was upbraided. She was told that it was cruel to cause needless pain to others. "Oh," she said, "I take no pleasure in the pain of others. I did that thing because it is the only way to see a Congressman doing anything in a hurry." With the sentiment of this country in favor of good roads and of federal aid to good roads, powerful, widespread, almost irresistible as it is, going to the halls of Congress and knocking and demanding that action be taken, that action cannot be refused; but before that is done there must be something concrete about the demand. It will not do simply to say, as we have heard said so many times during the past years, "We want good roads, we want federal aid to good roads." Everybody agrees that those things are sound, that those demands are sound; the point now is to go to Congress and say, "Here is the plan which we ask you to put in operation through statutory provision. It does not satisfy everybody. If we wait until we get a bill satisfactory to everybody, this thing never will be done. It must be a matter of concession, it must be a matter of compromise, it must be a matter of broadmindedness. Selfishness and provincialism must give way to nationalism, because if we are really a nation we must have roads national in character and national in usefulness. Hence we come to Congress. Now, what shall be the plan? We have listened to an inspiring and enthusiastic address by Mr. Shackleford, member of Congress, and a most eloquent one by another member of Congress, Mr. Borland, and a delightfully, polished interesting address from the editor. I call you to witness that there must be a difference between the intelligence of Mr. Shackleford's constituency and that represented by Mr. Borland, because they spoke about the farmer in an entirely different way; but, Gentlemen, I am not in politics, I do not want anything of politics; I am not in office nor do I want office. I am not running a newspaper, therefore I cannot speak in headlines, but I can speak, those being the circumstances, and say just what I mean, and I mean that everybody is agreed that this country is entitled to better roads. I say and I mean that everybody is agreed that the federal government must and should have a hand in their construction, because, as a



nation, it must have a national system of highways. I say and I mean that the time has come for Congress to act. The thing has been thoroughly discussed, exhaustively considered, and it is time now for concrete action. The question whether the States should control the expenditures within their borders or whether the federal government should control them, the question of how much and in what proportion the federal government should contribute moneys for the construction and maintenance of roads inside the limits of separate States, those things have been now so threshed out that we know where we stand; if we don't, we ought to know, and I say to you that some legislation on the subject is better than no legislation. Let us avail ourselves now of the conclusions which have been reached after intelligent study of the question, let us take the intelligent view of a substantial majority of all the people on this subject. Now, what is it? I submit to you a plan and I submit to you a bill and I will offer, in a moment, a resolution with regard to it, which I believe should have the approval of every man who has given any thought to this subject, a bill and a plan which I believe should be and will be adopted by Congress and made the law; a plan and a bill which may need, from time to time, as experience teaches, amendment and improvement, but which, in their substantial, general features, solve the problem and answer the difficulties which have so far arisen. The plan is not my own, the bill is not my own; the plan and the bill are the plan and bill of Senator Jonathan Bourne, Jr. He has evolved a plan and drafted a bill, not superficial, not out of his inner consciousness, but after the most painstaking, the most detailed, the most microscopic examination of the whole question, and after the gathering of statistics which anyone who runs may read and understand and approve. May I take your time for a second to give you the essential features of that plan? The distribution of the moneys, in the first instance, which are to consist of a billion dollars, is based upon a logical, scientific apportionment among the States, reached upon the basis, not of area, not of wealth, not of population, not of acreage, but of all those things. The State which is large does not get an undue proportion; the State which is small in area, but great in population, does not get an undue proportion; the State which is wealthy does not get an undue proportion, but all those factors entering into the determination of the percentage to which that State is entitled, give to each State as near as human intelligence can figure it out, just the amount which, all things considered, it should have for the purpose. I am going to take, because Mr. Shackelford mentioned it, the State of Ohio for an illustration. The State of Ohio, for example, has an acreage of about 40,750 acres. It has taxable property or wealth in the amount of \$6,200,000,000. It has a population of 4,767,000. There are the acreage, the wealth, the population. Then it has of public roads 88,000 miles. Now, there have been objections to the taking of any one of those things



as the basis for the distribution of money and those objections have solid foundations and reason to support them, but this plan takes them all, the four percentages, and takes the average of the four, so that while the wealth of Ohio might be much greater than of other States, which were entitled to as much mileage of good roads as Ohio, another State might show disparity on another one of those four elements, but take them all together, population, acreage, wealth and miles of public roads, and, Gentlemen, you get a basis which is fair and equitable to very State in the Union; and taking the average of those four bases of calculation, Ohio's percentage would be 5.2 of the moneys to be distributed, of the billion dollars which is the fund, and that gives to Ohio \$50,200,000 to be expended, 20 per cent a year. How is the money to be raised? The money is raised in this way; each State, having a highway commission, makes its application to the federal government for its quota of the billion dollars and upon its application, it deposits with the federal government its State bonds at 4 per cent for the amount. The federal government issues against those bonds its own bonds at 3 per cent, leaving a margin of 1 per cent in the federal treasury, which, compounded from year to year, will pay off all the State bonds in fifty years. The plan is so simple that it challenges our admiration. That sinking fund in the federal treasury pays off the State bonds in fifty years and discharges them and the federal government returns them to the State cancelled. The federal government sells the bonds at not less than par, its 3 per cent bonds, at popular bidding throughout the country. Now, it does involve the proposition that each State must have its highway commission, but you know and I know that no road upbuilding will be had until each State goes scientifically to work at it and has its highway commission; the thing cannot be done at haphazard. Then, it is said, there are constitutional objections in some of the States against issuing the bonds. So there are, but no State can have any good roads, under any circumstances, through its own or other efforts, without the issuance of bonds; therefore, that constitutional defect may be remedied at this time and in this way as well as at any other time or in any other way. All this I say for the plan and for the bill, which is simple and precise and clear in its terms, and there is less objection to it than to any plan which has ever yet been devised. I say it is something concrete and that is the main point. I say it is something to which everyone can attach his influence and his name and for which we may stand shoulder to shoulder in the presentment of it to Congress, and if we do, if we have reached the conclusion that this bill in its general features, perhaps subject to some modification, is what we want, then Congress will give it to us.

Therefore, if you will indulge me I will offer a resolution, which I shall ask to have referred to the committee on resolutions which has just been appointed, for their consideration and report.

## ROAD LEGISLATION AND ADMINISTRATION SESSION

UNDER AUSPICES OF SPECIAL COMMITTEE OF AMERICAN BAR ASSOCIATION

September 30, 3.30 p.m.

FREDERICK D. WADHAMS, Chairman

THE CHAIRMAN: Gentlemen the first paper on our program this afternoon is, "The Merit System in Road Administration," by Hon. John T. Doyle, Secretary of the U. S. Civil Service Commission.

### THE MERIT SYSTEM IN ROAD MANAGEMENT

BY JOHN T. DOYLE

In the good roads movement the merit system is essential. The public roads constitute a series of great transportation systems which should be administered with all the business care and efficiency and all the technical skill that would be employed if they were owned by private corporations. Instead of that we have the spectacle of a hundred thousand or more road officials, most of them elective and very few of them required, under existing legislation, to have any knowledge of road construction and maintenance or to give any considerable amount of their time to the management of the roads. It is estimated that more than \$150,000,000 a year is being expended for the construction and upkeep of our public roads. It therefore becomes an important economic essential that this great outlay be expended under trained, capable and honest supervision.

Emerson has said that the beautiful rests on the foundations of the necessary. There may be abundant appropriations but without skilled engineers and freedom from the abuses of the spoils system the objects of your movement can not be fully attained. There must be feasible and reasonable ways of expending the many millions of dollars needed for good roads. There must be intelligent supervision by trained and educated road engineers, freed from political interference, if the expenditure of these millions is to secure beneficial results. Men are essential for the execution of measures. It is through the engineers down to the humblest employees that the roads are built and that the government serves its people. Practical governing is administration, and administration is the work of the civil service. Whatever will increase the integrity and effi-



ciency of the body of employees will increase the administrative energy of government and further the attainment of the ends for which government is instituted. The power of the government to carry on plans for the public good depends upon the intelligence and efficiency of the persons whose services it must employ. The efficiency of the civil service therefore touches to the utmost limits all that the government may be called upon to do.

Every advocate of good roads should be an advocate of the merit system as the vital means to an end. The need for an adequate system of administration such as will insure economy and efficiency in the highway bureaus needs to be emphasized. The problem is a technical one. It relates to securing the best qualified employees, their systematic training, the removal of those who do not measure up to a proper standard of efficiency, the correction of defects in organization and conditions of employment, the comparison of results with outlay, the measurement of service and its correlation with pay, and the collection of information concerning the service for the use of the responsible executive officers. The part that the civil service reform system takes in this problem is as an aid to the appointing power in testing the character and fitness of candidates for employment, irrespective of their politics; seeing to it that employees do not indulge in political activity, and in maintaining an efficiency system upon which promotions and removals will be based. The main essential is to take the management of the public roads out of politics, to secure skill, honesty and efficiency in the expenditure of the funds for their maintenance, and to ensure stability of administration independent of changes in control by political parties.

In the classified service of the federal government great advances have been made under the merit system. About 300,000 positions in that service and as many more in nine States and about 250 cities which have adopted that system, are taken out of politics and are subject to competitive examination. As governments grow and their technical activities expand, it becomes increasingly necessary in the maintenance of free institutions to guard against political abuses and to procure the highest grade of employees who are willing to work for the salaries paid.

The merit system of appointments was adopted in the federal government and in the State and city services of New York and Massachusetts nearly thirty years ago. The beneficial effects of its enforcement and of its continued development and increasing application are now more than ever apparent. Appointments and removals in the more than half million positions in the parts of the service under the merit system of the nation, States and cities are withdrawn from politics and made with increasing regard to the interests of the public service, and a higher order of character and efficiency is manifest in those services. The popular approval of the merit system as a means of securing economy and efficiency and of suppressing abuses due to improper political influences is nearly



universal without distinction of political faith. The American people are satisfied with the results of that system and there is no longer any organized opposition to it.

The merit system has been the means not merely of supplying qualified technical experts and of opening a worthy career of public employment to them, but of aiding the orderly development of technical work in the public service which was not possible under the debasing influences of the spoils system. Since the adoption of the merit system there has been an enormous expansion of technical activities in the Nation, States and cities and a wider field of usefulness has been opened to persons of technical education, with tenure based solely upon fitness. The public service is becoming more inviting as a field of employment, and on its technical side offers opportunity for research and broadening of training.

Many technical positions require not only high expert knowledge, but also high expert administrative ability; and the examinations held for them are systematic and thorough inquiry into the education and training of candidates, their achievements, experience and success in handling men, and ability in executive affairs. These qualifications are considered by examiners who are themselves recognized authorities in the subjects embraced. The securing of competent experts to carry out the details of administration should no longer be left to the discretion of those in authority to be affected by personal and political interests and prejudices, log-rolling and partiality. It was this uncontrolled selection that led to the spoils system. The time and efforts of those directing large enterprises should be given to the higher problems of their profession and should no longer be expended in the distribution of patronage and elections corrupted by seekers for public office. The better way is to leave the investigation of the character and fitness of candidates to skilled experts under an orderly procedure.

An illustration of the methods of testing fitness by competitive examination followed by a period of probation, let us take the examination for senior highway engineer in the federal service, the entrance salary for which position ranges from \$2220 to \$2700 a year. The duties of this position involve the superintendence of the construction of object-lesson roads of various types throughout the United States. In addition these engineers are called upon to inspect roads and investigate road-building material in counties for the purpose of reporting upon a system by which the best administration, construction and maintenance of county roads may be secured. They are also expected to inspect roads locally and to advise in regard to their improvement, and also to address road meetings. Entrance to this examination is limited to technically educated men who have had at least five years' actual experience in practical highway engineering work. Applicants are not required to appear at any place for examination, their relative qualifications being determined from their own statements under oath concerning their education, experi-

ence in highway and general engineering work and in delivering lectures and addressing meetings, and from statements concerning their capabilities secured from persons acquainted with their work. This is rather an investigation into the qualifications of applicants than an examination. The applicant is required to give the names and addresses of five persons unrelated to him who have personal knowledge of his education and qualifications and who will answer questions regarding him. Inquiries are made of these persons. He is next required to submit a statement of his general education and technical training, the institutions where he has studied, the time spent and dates, courses pursued, and degrees, if any, conferred. He must state the material facts in his career, telling of his occupations and also submit a statement of the professional and technical experience he has had along highway engineering lines, and when, by whom, and the class or character of work upon which he was employed in each case. He must also state what experience he has had in executive capacities, giving full details as to the number of men under his supervision, and the degree of personal responsibility involved in each case. In the marking his education and training have a weight of 4 in 10 points; professional and technical experience and fitness, 5; experience in delivering lectures, 1. For some positions oral tests are also required to give the examiners a better knowledge of the personality of the candidate but this is not required of the engineers. This type of investigation furnishes essentially the same bases of judgment as those which an ordinary employer of men would use in inquiring into the fitness of applicants whom he does not personally know.

Appointing officers who have had experience in employing men through these examinations recognize that competitive tests are better than those heretofore employed. In Philadelphia the chief of the bureau of highways and street cleaning, an office with a salary of \$6000, and nine assistant commissioners of highways, have been appointed by competitive examination. Experience in that city, and New York, Chicago, and other municipalities demonstrates that the competitive system is adapted to the highest administrative and expert places in city governments.

Recently Congress has authorized the expenditure by the bureau of public roads of a fund for the building and maintenance of short stretches of typical roads in the various States of the Union, and the civil service commission has been called upon to hold an examination to provide a road patrolman, whose duties will be the care and maintenance of such a stretch of road. This being practically a skilled laborer position, applicants were required merely to submit to a physical examination and their relative qualifications were determined from the results of this physical examination and a consideration of their statements of training, experience and general fitness. Each applicant was required in advance to show that he was provided with proper equipment, including horse, cart and



implements for properly caring for the road. Receipt of applications for this examination was also limited to persons living within half a mile of the stretch of road to be maintained. The compensation for this position was \$720.

Early in the current year the commission held an examination to provide eligibles for filling a position of lecturer on road economics. This examination was limited to women, the duties of the position being to address women's and children's meetings in the interests of good roads with the object of producing and encouraging an interest in the good roads movement among women and children. An effort was made to secure the services of women who have had experience in lecturing, teaching, traveling and writing for publications, and special emphasis was laid upon experience in teaching on the economical, historical and social side of road improvement. This examination was of the non-assembled type, the relative qualifications of the applicants being determined upon their statements concerning their education and experience, together with copies of their publications or a thesis on good roads, and additional information concerning their fitness secured from persons acquainted with their work.

From time to time vacancies occur in the technical and scientific force of the Office of Public Roads, requiring an examination to fill such positions. Among such examinations in recent years has been one for expert tracer and bridge draftsman at entrance salaries ranging from \$1200 to \$1500, and one for assistant chemist at salaries ranging from \$1800 to \$2220 a year. In the former, three years' experience in engineering work or drafting was required for admission to the examination, unless a person was a graduate of a technical school, in which case one and one-half years' additional experience was required. The examination consisted of methods of designing, lettering, drawing and training and experience. An assistant chemist examination was of the non-assembled type, covering education, experience and publications or a thesis. For this examination a chemical or chemical engineering education was required. The duties of the position to be filled consisted in the testing of materials for use in road construction, laboratory and field research upon the behavior of these materials in practice, and such other phases of chemical engineering as apply to the construction and maintenance of highways.

In connection with the good roads exhibits of models of sections of typical roads, which exhibits are sent by the Office of Public Roads throughout the United States, the commission was recently called upon to provide a modelmaker, capable of making such models of roads, culverts, bridges, etc. The salary for the position is from \$1500 to \$1800 a year and the relative qualifications of the applicants were determined from their training and the work which they had accomplished of a similar kind to that required in the position for which the examination was held.



Within the past month the commission held an examination for mechanical engineer at \$3000 a year for the Office of Public Roads. The duties of this position will be to initiate and carry on research in the field of engineering, particularly in conducting traction tests on highways. Application for this examination was limited to persons who have received a mechanical engineering education and who, in addition, have had at least five years' practical experience in mechanical engineering, including some practical experience in conducting traction tests. Their relative qualifications for the position will be determined from their statements of education and experience, from their publications, and from statements secured from third parties concerning their fitness for the position.

The position of assistant director in the Office of Public Roads has recently become vacant by resignation and the commission has been requested to hold an examination to fill it. An examination will be announced in the near future to fill this position at \$3500 a year. The duties are largely administrative and supervisory and entrance to the examination will be limited to persons having an engineering education who in addition have had extended experience in highway engineering work. The relative qualifications of the applicants will be determined from their statements of education and experience, both in highway engineering and in supervisory positions, and from a consideration of their publications together with statements concerning their fitness for the position secured from persons acquainted with their work.

High grade experts of mature experience do not like to exchange steady private employment for State and municipal service as conducted today, with short or uncertain terms of office, during which they are subject to dictation from politicians. They cannot afford to give up a certainty for an uncertainty and to exchange a reputable engineering practice for a political job. Those engineers who do accept these positions are under strong compulsion to be politicians rather than engineers. They are forced to look out for their own selfish interests at a time when they should be directing their full energies toward the efficient discharge of their duties. A man may be a good politician or he may be a good engineer but he is rarely both. Where, however, positions are made practically secure and where successors can only be chosen by a method from which favoritism is eliminated and sufficient powers are granted them, well qualified experts do not hesitate to submit to an inquiry into their fitness. This is not only true on the continent of Europe but has proved true in this country as, for instance, in Chicago, where the city engineer, the engineer in charge of bridges, the city auditor, the chief street engineer, the building inspector in chief, and the chief librarian, with salaries ranging from \$3000 to \$8000 a year, have been appointed under civil service rules. These competitive tests have also been successfully used for heads of bureaus in New York State and City, in Philadelphia, and in the federal service.

These tests are found to attract men of the highest caliber where the salaries are on a commercial basis. Where such systems have been in operation for a number of years, there grows up, as there has in England and Europe, a large body of municipal experts in the various branches of governmental activity, who begin their careers in cities of moderate size or as assistants in large cities and by promotion from one city to another or within the same city, reach the highest positions.

The United States army engineers are an example as a profession. They have nothing to do with the initiation of their work except in the way of advice or of the appropriation of funds and all their expenditures are carefully scrutinized by an auditor and a comptroller, who disallow any item not strictly within the appropriation and law. A very little of the vast sums which they administer has gone for corrupt purposes. The Panama Canal and our great waterways of commerce are splendid tributes to the genius of army engineers.

Public attention should be called to the opportunities for youth in the profession of road engineering as a career. Road building should be a career and not a mere makeshift. In the making of surveys, the preparation of plans, estimates and specifications for bridges, a high order of technical ability is requisite. In providing adequate drainage systems, in the selection of road materials, in making the dimensions of a road conform to a given standard, a great deal of practical and expert knowledge is necessary. There is scant provision in the way of schools for training such engineers, except as is carried on in the federal bureau of public roads or where courses of instruction have been introduced in small ways in universities. Columbia has recently introduced a graduate school of highway engineering and if there is a public demand for men qualified in this profession other universities will supply like schools. The Office of Public Roads under the federal government has a corps of civil engineer students, recruited from competitive examinations held by the United States civil service commission. These positions are limited to young men who have received a technical education and who desire to enter road engineering, and are designed to offer practically a post-graduate course in engineering to such students. Part of their time is devoted to office and laboratory work and the remainder to practical road building in different parts of the country. The position pays \$720 a year and from among these young engineers many of the highest places in the Office of Public Roads are filled.

A standard of administration will be developed in time and generally adopted. Such a standard will require the enactment of civil service laws by the remaining States, under which it will probably be necessary that the county board of commissioners or supervisors should retain the power of appointment of local road officials but their appointees will be required to meet the tests and conform to the regulations prescribed by the proper State department. The



fact that there existed a body of trained experts to carry on the work with a well-planned system of administration would inspire the public with confidence that the vast sums necessary for appropriation will be wisely expended and not constitute a bribery chest for political spoils.

The State and city governments which do not have merit laws should be urged to follow the example of the national government and the larger States and cities and place their services upon a merit basis. Because of the efficiency and stability in the administration of the executive civil service in the national government and its freedom from political abuses the public is looking more and more to the national government to do things which under our scheme of government properly should be done by local authorities. It is urgently necessary that the local governments should realize their duties and responsibilities in this regard. The demand is widespread that the people shall be efficiently served, that their common affairs shall be honestly and intelligently administered, and if the local authorities do not meet this demand there will be increasing centralization in the government of the nation.

THE CHAIRMAN: The next speaker on the program was to have been the Hon. James R. Marker, State highway commissioner of Ohio, but he is unable to be here this afternoon and we will move on to the next part of the program. It has been my experience in various organizations that the secretary is a very important member, and in the language which prevails in this town, in describing him I would say that he had to be the pitcher and the catcher and on first base and second base and third base and in the field and stopping everything that goes wrong and seeing that everything goes right. I am sure that Mr. Pennybacker, if his services and his words of wisdom were to be expressed in dollars and cents in his name, he would be called "Million Dollar Backer" instead of Pennybacker. We will now listen to Mr. Pennybacker, his subject being a plan for simplifying road legislation in the States. Mr. Pennybacker.

## A PLAN FOR SIMPLIFYING ROAD LEGISLATION IN THE STATES

By J. E. PENNYBACKER

*Secretary American Highway Association*

Some years ago I had occasion to have a little talk with a bookkeeper in a railroad office, and while I was talking to him, a man came in and shook hands with the bookkeeper and said, "I am very glad to see you, General," and after the man left, I said, "Why does he call you General? I didn't know you had such a title."



"Yes," he says, "I'm general bookkeeper." Now, there are secretaries and secretaries. Yesterday you heard a secretary who has given a great deal of prestige to the title of secretary, and then there are secretaries who bury themselves back in a corner somewhere behind a lot of papers and register delegates and do things of that sort, but who do not aspire to the dignity of appearing before the delegates on the lecture platform. That is the kind of a secretary I am. I am not going to attempt to make a speech; I am going merely to make a suggestion to you and, following the rule of newspaper men who say, "Tell the story in the headlines." I am going merely to give you the headlines. The plan I have to suggest is this; that this American Road Congress constitute a committee which will be charged with the duty of conveying to the governors and legislatures of the several States, a proposal that each State designate an official or a commission to codify and assemble the road laws of the State. That is the first step. Second, that that official or commission be authorized to become a member of an official interstate commission composed of similar officials or commissions and that these men proceed with this great mass of information which they have gotten together, to boil it down and to recommend to their respective States, the simplest, most clear-cut, most politically free road legislation that can be conceived. Now we all know that for over a hundred years, such of the members of State legislatures and particularly of the new members, who knew little of parliamentary law and less probably about roads, would introduce road bills as a last resort when they could think of nothing else to attract attention from their fellow citizens. The result has been that the road legislation in all of the States has grown piece by piece, just as you see some old houses that have been built, first one room and then two and then three and then a second story and then another story, until you have a ramshackle building that presents all the styles of architecture from Queen Anne, as they say, to Mary Anne. Now it is almost impossible for the men who are actually students of road legislation in their own States to keep up with what laws are in actual effect in the State. I talked to a prominent road man some time ago who said that road contracts were held up in his county because they could not tell under which of three classifications the road came and a different financial plan applied to each one. We all know that the greatest bane of road administration in this country is politics, and the only way we can remove it from politics is to have a plan suggested by this non-partisan, unbiased, interstate commission which will combine the best features of every State law and recommend to their respective States that which is applicable to them. In the first place, they will find that there are certain features which are common to all the States. They can lay that down as a foundation, basic principle. They will then get on up with their structure until they come to a point where the conditions in the States are dissimilar and they must

change, have this sort of a law for Massachusetts and this sort of a law for Mississippi. For example, Massachusetts might say, when it comes to legislation for working convicts on roads, "That will not apply to conditions in our State; we don't have the climatic conditions, and we don't have the same type of labor you have in Mississippi." On the other hand, Mississippi might say, "Convict labor on road work is for us the most effective, equitable and practical use of the convicts," and so there you come to the lines of diversion. Now the man from Massachusetts will proceed along his own lines to write in the legislation which is applicable to his State; the man from Mississippi will write in the legislation which is applicable to his State, but the man from Massachusetts may find that the man from New Hampshire and the man from New York can give him some very valuable points in framing the law for Massachusetts. The man from Mississippi may find that the man from Georgia and the man from Alabama can give him some excellent points for inclusion in his law, and so, with this unbiased, non-partisan commission recommending a system of legislation free from politics, you will have the best possible chance of putting through the legislature of the State the laws for which we have been waiting for over a hundred years. Now, the American Bar Association, under whose auspices this meeting is held this afternoon—if I am incorrect in this, please correct me—has a committee on uniform legislation, hasn't it?

THE CHAIRMAN: Yes, Mr. Terry is chairman of the committee.

MR. PENNYBACKER: Therefore we know it must be a good committee. When such a commission has completed its labors and recommended to the State the legislation that should be enacted, I have no doubt that the entire power and force of the American Bar Association will be thrown back of that legislation and put it through in spite of all the obstacles that petty local politicians may oppose to it. I am not going to make a speech. I think I have given you clearly what I have in mind. It may not be worth while. I had a friend in Washington, a newspaper man, who would always, after talking for hours and talking everybody to death, wind up by saying, "Well, boys, I guess I'll go up to my room and write a little rot." He was asked, "Why do you say that? Why don't you say, 'I am going to write a little,' we all know what you are going to write." I will give you the suggestion for what it is worth and Mr. Huston, who is chairman of the Ohio commission for State road laws, is here prepared to tell you how they are going about it in Ohio, and I earnestly hope that this session will take steps to get some such plan under way, because, after all, the problem is not merely to solve the problem of national legislation, but it is equally important to solve the problem of State legislation.



THE CHAIRMAN: Ohio has produced two of the greatest men this country has ever seen. I am proud to say that one of them is today president of the Association I represent. We will be very glad to listen to Mr. Archibald H. Huston, of Columbus.

#### ADDRESS BY ARCHIBALD H. HUSTON

Mr. Pennybacker rather misstated the facts when he stated that I was here prepared to say what the Ohio commission, appointed to revise the road laws, is going to do. His story about the house built of many rooms, many sizes, many shapes and many colors might apply to the road laws of Ohio. I have said on two or three occasions that Ohio is a prolific State. Among things we raise are pickles, and a gentlemen from an adjoining State is advertising fifty-seven varieties of Ohio grown pickles. We in Ohio have fifty-seven varieties of road laws and it takes one lawyer to interpret them and four judges to decide which law is applicable to any particular piece of road that the people may undertake to construct. Now, the commission appointed by the governor, in accordance with a legislative act, has merely begun its labor. They are seeking information. They come here to Detroit in a body to seek information; to listen to what may be said, and with the desire to take home with them valuable suggestions. The commission has gone, I might say, just this far; it has decided unanimously that, so far as possible, the various road laws of the township, the road district, the county and the State shall be uniform in their plans of construction and in their plans of operation. In that part of the law providing for State-aid or State construction, will be extended a hand to the federal government seeking federal aid for federal roads. Further than that we have not been able to decide just what plans or what course to pursue. We have sought information from every State in the Union. Ohio, while one of the oldest States in the Union, has gotten its road laws into a very chaotic state. As Mr. Pennybacker has properly said, a great many legislators, lacking something else to present, would present a road bill applicable to their particular district and suited to the wishes of their constituency and I cannot help but say, in accordance with Mr. Pennybacker, that there is a great need of uniformity. There is that same need of uniformity of State laws applicable to reconstruction and maintenance of roads that there is to other laws. There is a commission in existence, of which Mr. Terry here is chairman, on uniform laws and uniform legislation, and I believe that I can say truthfully that some of the best laws for the citizens of Ohio that have been enacted in recent years are those laws recommended by Mr. Terry's commission. I do not know of but one or two States, for example, that turned down one very important law (that is the warehouse receipt act, so-called in which I happened to be personally interested) that was recommended by this commission on uniform laws. It is reason-



able to suppose that the same is true of road legislation, and I most heartily endorse, and am sure the commission will stand with me in endorsing Mr. Pennybacker's suggestion of a joint commission, an interstate commission, to undertake to codify and rewrite the laws of the various States and get them on a uniform basis. Gentlemen, permit me to take this opportunity to extend to you all an invitation to offer, and we beg of you to give us, any suggestion that you may have looking to the betterment of the road law situation in the State of Ohio. Our room is No. 318 at the Pontchartrain Hotel and we will be glad to welcome any of you there and hear any suggestions you may have to offer. I thank you.

MR. PENNYBACKER: Mr. Chairman I don't like to inflict myself upon this audience twice in so short a space of time, but one of our troubles has been that frequently if an idea is either good or bad, it dies in the meeting. Now I want to make a motion that the chair be authorized to appoint a committee of five to confer with the committee on uniform State laws of the American Bar Association, for the purpose of ascertaining if any feasible plan can be worked out in a cooperative way with this committee on uniform laws, looking to the submission of some plan to the governors of the States and the legislatures of the States. Therefore I move that the chairman be authorized to appoint such a committee. (Motion seconded.)

THE CHAIRMAN: Gentlemen, you have heard the motion. I would suggest that it might interest you, I am sure it will, to listen to a few words from my brother and friend, Mr. Terry, who is chairman of our commission on uniform State laws. Mr. Terry.

#### ADDRESS BY CHARLES T. TERRY

This makes me distinctly a repeater. You had to listen to me this morning, those of you who were here, but I am always and everywhere glad to speak on the subject of uniform State laws. I am going to be very brief and I am going to make my points and then I am going to stop. I don't know much about public speaking, but there are three cardinal rules which I do know are good rules, and one is that a speaker should stand up so that he may be seen, and the next is that he should speak up so that he may be heard, and the third is that he should shut up after he has finished. Now there is one trouble recognized everywhere I think in our country, about our system of government, our dual system of government, whereby the federal legislature, called Congress, is enacting laws applicable throughout the whole country on various subjects, and each separate sovereign State is at the same time enacting laws for that particular State, which laws may be at variance with the laws on the same subject of every other State and also at variance with the laws enacted by Congress on pretty much the same subject,

so that at times no individual can know where he stands with reference to any particular right or any particular crime which may have been defined by statute. I find that confusion nowhere in clearer form than in reference to automobile laws and road laws. Any man who happens to pass over the imaginary line between two States in this day is more than likely to become a criminal without the slightest consciousness on his part that he is becoming such. Now, that is an absurd situation. It is not consonant with common sense; it contravenes all reason, because I submit to you that there is no such distinction between one community of this country and any other community of this country, no distinction arising from geographical positions or climate or social situation, which would justify the enactment and enforcement of different laws, different jurisdictions, regulating the use of the highways by the automobile, for example. What is necessary for the protection of the highways in California is equally necessary for their protection in Michigan, and vice versa, and yet you put the various laws of this country in parallel columns and see what you will find. No man possibly could know them all; no one possibly could obey them all, because if he kept in mind and obeyed implicitly one law, he would be violating another law, the law of another State when he has passed the imaginary line which divides two States, and there you are. I say it is an unreasonable, an outrageous, an absurd situation. Now that situation has got to be cured in some way. There is no argument for any but a uniform law governing that same subject in all of the States of this country. That applies not only to automobile laws, that is to say, laws regulating the automobile; it applies to many other subjects. It applies particularly, as has been suggested this afternoon, to the road laws, I mean the laws not regulating the use of the roads, but regulating the construction and maintenance of a system of roads, and that is the topic upon which we are at the present moment. What would be said, for example, if every State by statutes required a different gauge for the steam railroads or the electric railroads of the country, so that the gauge in one State would be 4 feet, in another State  $4\frac{1}{2}$  feet, in another State  $3\frac{1}{2}$  feet, in another State 5 feet, and so on. It would simply mean that there could be no interstate traffic on railroads, which use rails, at all, because the locomotive and cars coming to the border of New York and intending to go into Pennsylvania, could not go on because there would be a difference of several inches between the gauge of the two roads. The commerce of the country would be strangled; there could be no such thing as national commercial transactions and yet that situation would be no more ridiculous than to have laws governing matters of interstate interests, variously and divergently providing for the other operations or transactions of citizens of the country. Now we talk about States' rights which could interfere with the enactment of uniform laws. If they did, they would not be any longer States' rights, they would be States' wrongs. It is



a matter of common sense that things which are of general application should be governed by general, uniform State laws. Well now, there is a way of obviating this difficulty. It so happens that not only the American Bar Association has at the present time a committee whose duties are concerned exclusively with the making uniform of the laws of the various States on subjects which common sense indicates should be uniform, but the American Bar Association twenty-five years ago gave birth, through its committee on uniform State laws, to a separate body, a body composed of the official representatives of the States, appointed by the Governors of the States to devote their time and energies and what capacity they have—let me say, in parentheses, without compensation—to the unification of the laws of the States on matters of interstate interest. It so happens that I have been for some years the representative of the State of New York in the general national body which is called the Conference of Commissioners on Uniform State Laws. We have taken hold of many subjects, ranging from marriage and divorce to the subject which was referred to by the last speaker, warehouse receipts. Our uniform negotiable instruments act, for example, has been enacted in every State, territory and federal district of this country except one. I mention that simply to demonstrate that the thing can be done, because it has been done. Now it only remains for me to say that the committee of the American Bar Association on uniform State laws and the Conference of Commissioners on uniform State laws will be very glad indeed to coöperate with your committee to secure, as far as may be, uniform laws on this subject of road building, road maintenance and road legislation and regulation and all the incidents which go to make up the details of this movement which is so powerfully backed and so powerfully carried forward today as illustrated by this convention. Thank you, Mr. Chairman and Gentlemen.

(Mr. Pennybacker's motion was then unanimously adopted.)

THE CHAIRMAN: Mr. Kenyon, the President of the Indiana Road Association has given great thought to the subject of road legislation, and I am sure will interest you.

#### ADDRESS BY CLARENCE A. KENYON

##### *President Indiana Road Association*

I had no expectation of being called upon, but road legislation is a matter that I am very much interested in and I am sure that you are, and that anything I might say that would be in the nature of information or suggestion that will help you, will help the cause. If this commission has or will recommend a bill or a series of bills that they can send to the various States recommending such bills



as legislation that would be suitable for the various States, I am sure that we will be very glad to receive it in Indiana. I was recently in London attending the International Road Congress. There were thirty-nine countries of the world represented there. Everyone was asking what are we going to do with our roads, they are wearing out, what kind of legislation shall we enact, and what kind of construction shall we adopt? What is the best? And so this great congress of experts, consisting of over three thousand members, were devoting their attention to these questions. I will give you an idea of how they proceeded. They started out months before the congress met, and said to each country, "Select your best man upon the matter of legislation or organization for roads as well as on other road questions, and let him submit a paper;" these papers were sent in and translated into the three languages that would be used. All the papers on any one subject were given over to a reporter or a series of reporters, to go through them, and report what was the consensus of opinion from those papers. Those conclusions were then presented to the congress and were open for acceptance, amendment or rejection. This one question of organization and legislation took more time and attention of that big congress than almost all the rest of the questions put together. The engineers could solve the question of construction, material and maintenance, in a way, but when it came up to the question of organization, laws, the raising of money to pay for roads and so on, they were at sea. Some thought one way, some thought another, just as we here, as was apparent this morning. Here is Mr. Shackelford with one idea, here is Mr. Borland with another idea, and when we were at Washington two or three years ago we found sixty-two bills in Congress on national aid, each with a different idea. To get the minds of the people concentrated on any particular plan seems to be difficult, so in each State we have the same trouble, and I think if this committee that these gentlemen are working with, can outline a law or laws that they can recommend as uniform for all the States, it will be very acceptable, and the quicker the better. One principle that I might say, they were united on over there in Europe was this first, that the unit of organization should be large enough, in every instance, to properly finance a road and provide for an adequate staff of expert men to properly construct and maintain it. The very statement of it seems to be true, doesn't it? All the laws should be built upon that idea. The next proposition was, that no road should be built where there was none needed, and, as a corollary to that, no roads should be built that costs more than the necessities of the road demand, and as a part of that same thing, this proposition, that no road should be constructed when the unit can not afford to construct it well enough, to bear the traffic that is going to pass over the road without excessive maintenance charges. These seem to be very simple things, don't they? They appeal to everyone as being true, and yet, are

we in this country, not building thousands of miles of road just simply because of its cheapness, \$1500 a mile, and \$2000 a mile roads, that will be destroyed in a few years, before the bonds, that are issued to pay for them, are paid. Why, in Indiana, where we have the idea of extreme localization, each township has the power of issuing bonds to build roads. The county cannot issue a single bond or appropriate any money to build a road, the State cannot issue a single bond or appropriate any money for building a road, under our law, so that every road that is built must be paid for by the township. The large cities are exempt. See what it has done. Take the little county of Park over in the western part of the State; I think the largest place in it is the county seat, Rockville, which has about 4500 people, and yet they have over 650 miles of roads that have been built, and paid for by mortgage and bond issue running from ten to twenty years against the land in the townships of that county. They don't need all that road, built at the cost it was built, any more than a dog needs two tails. In my opinion they could get along with very much less road; in other words, they violated one of the cardinal principles that the London congress adopted which I was speaking about a minute ago; they had the very small unit of organization, a township. The unit was so small that they had to look to the casual man that was elected as road supervisor, or county commissioner every two or four years, to administer it. How could they get an adequate force of experts, or how could they properly and economically finance with those small units? They can not do it. They have issued the bonds, and do not properly keep up the roads. The result is that the roads are being destroyed, and before those bonds are all paid, the roads will be worn out. A demand for new roads comes along, and they cannot issue any more bonds, because the bonds issued for those that have been destroyed, have not been paid. That is the difficulty we meet with in this country, so I say we will hail with a great deal of delight and pleasure the report of a committee that will recommend such laws for general adoption by the States as will answer these problems. If we follow the idea, that a road should be so well built that it will answer the demands of the traffic that may be put upon it we will get somewhere. I saw an instance in England; there was a road running down in Shrewsbury, which had a very enthusiastic local community, a very competent civil engineer; those people wanted the road maintained; it was merely a macadam road; it cost \$750 per mile per annum to maintain that road, and yet those people permitted themselves to be taxed sufficiently to maintain that road, rather than not have it. They wanted the autobus service that a farmer had started where the people could pay as you do in a street car, and ride backwards and forward through that county. Of course there was plenty of land in that county, that is not anywhere near the road, but still they could go a mile or two to the road and then go a long way by just getting

333618A



into an autobus, for 5 or 10 cents. On another road running to Maidenhead, another engineer, than whom they said there was none more competent, as engineers go, but who had the advantage of a larger unit, a general road board. He said there was no use doing the uneconomical thing of trying to maintain the road at the big cost of \$500 to \$700 a mile, we must reconstruct the road and put a surface on that will be adequate. They followed his advice and did it, and the general road board, like the national government, contributed to the construction of that road. After the road was finished, they found it was only costing £5 or \$25 per mile per annum to keep it up, instead of \$750 a mile. That is the thing I say we need in this country. We must balance the cost against the maintenance, to make the road economical to maintain, and our system of administration should be so timed, that the tax is properly and equitably distributed, then you will find the people in this country just as enthusiastic, patriotic and anxious to have good roads and willing to pay for them as they are in England or any other country. I think this conveys the idea that I have upon this subject, and I again repeat that we, in Indiana, will certainly welcome the report of the committee, and I hope we will get copies of it at the very earliest date possible. Let me tell you another thing: just for a moment; many of you are not from Indiana and don't have the troubles we have there. We have 92 counties and 1017 townships in the State, which has an area of 35,000 square miles, in round numbers. Can you think it possible that, with that area, we would have 6500 road officers, men concerned with the building and maintenance of roads? Well, we have. It does not seem possible that you could get such a force in our country that would be competent. You know we could not. We haven't, and yet they are men that are anxious and willing to do their duty, but they don't know; the unit of administration is so small, that it cannot be properly financed and they get no aid from the State, and while they get aid from the county in the way of maintenance, they get no aid from the county in the way of construction. Here are three commissioners from each county—92 counties, 276 officials right there, then there's 92 county surveyors, and the county surveyor does not have to have any other qualifications than merely being a voter and a citizen of the county. I have known drug clerks and men working in a hardware store to be elected county surveyors. The unit of administration is so small that you do not get competent men, you do not get the thing that the London Congress was insisting upon, a competent staff. Then each county divides their roads, they call them improved roads, up into districts and allows the county commissioners to employ a man for each 10 miles of road, as a sort of a foreman to look after them in the spring and fall, and then we have this 1017 townships with one trustee for each township; each township then can have from two to six supervisors, according to the size of the township; there are 2500 of them.

They get \$2 a day for sixty days, there's \$120 each, imagine the large sum paid out in salaries to this 6500 men over the State. Can you imagine them as a competent staff? There's no direction, no head, no harmonizing of effort, and such are the troubles we have in Indiana, and I have no doubt to a lesser extent they have that same trouble in other places, and when I told that to the London Road Congress, there was just one shout of "Ha! Ha! can that be possible?" No country in the world has any such extreme localization as we have in Indiana and I hope no other States have, so you see the necessity of wiser laws. Give us the report of the committee. Gentlemen, I thank you.



## CONSTRUCTION AND MAINTENANCE SESSION

October 1, 10 a.m.

A. N. JOHNSON, Chairman

THE CHAIRMAN: Gentlemen, come to order, please. We regret that we received a telegram from Colonel Stevens stating that he will be unable to be here, and Mr. Page asked me to preside in Colonel Stevens's place. I understand that most of you have received copies of the papers. If you have not, copies will be furnished to those who desire them. Owing to the fullness of the program and the limited time, it seems desirable to make some definite provision as to the time to be consumed by each speaker. We will allow the authors of the papers five minutes in which to summarize and explain their respective papers. The gentleman who makes the opening discussion will be allowed ten minutes and two minutes discussion from the floor, and I will ask all of you to please observe these rules. The first paper on the program is by Mr. W. S. Keller, State highway engineer of Alabama, entitled "Unsurfaced Roads." Mr. Keller.

### UNSURFACED ROADS

BY W. S. KELLER

*State Highway Engineer of Alabama*

When I was notified by the secretary that I was expected to present a paper to this Convention on the subject of "Unsurfaced Roads," I was considerably worried for the reason that I read a paper at the Convention at Atlantic City last year on earth roads. Now, the difference between earth roads and unsurfaced roads is about the same as the difference between Tweedledee and Tweedledum, so I have had to infringe to a certain extent on my paper of last year in the preparation of a paper for this year and I hope those of you who have read that paper will forgive me for repeating to a very great extent what was said in that article. I believe all engineers are prone to build high class roads. We all like to see a finished product. In our efforts to build these roads, we are inclined to overlook the little man, the man who has an earth road leading to his home and will, perhaps, never have other than an earth road, so my paper is particularly appealing to you in behalf of the minor class road. Now, in our efforts to build earth roads, the main work we have to do in the South is to locate our roads. Our roads

have never been located. We are still following in many places, the trails that were laid out by Andrew Jackson and even the trails that were made during the Civil War by the armies that marched through the States. The trails, of course, were made wherever the armies could get through. They avoided marshes that possibly could have been filled over; they made long detours where, perhaps, by a little work, a shorter course could have been found.

I was reminded by the chairman that I have only five minutes to discuss my paper. That is a right hard thing to do, to know just what particular feature of a paper you have written you want to discuss, so I don't know anything better than to say it is with you and I hope you will bear in mind that I am writing from an Alabamian's standpoint, from a Southerner's standpoint, you might say, about earth roads in Alabama. I do not propose to tell you what the earth roads of Michigan, New York and other Northern States are, because I am not familiar with them, but I am writing of the construction and maintenance of earth roads in the South. Now, we all know that the greatest thing we can do to maintain earth roads is to constantly use the drag. The greatest trouble we have in the South is convincing our commissioners that the drag is of value; it is too simple. I have often said that if a drag was manufactured and beautifully painted by some machinery concern just exactly like the old wooden drag with a great big name on it, manufactured by "Blank Company" and \$50 charged for it, commissioners would buy them and use them freely, but because they can make them in their own barnyard, they don't believe what you tell them. We have got fine results in some sections of our State by the use of the drag, but I do not believe the drag will do everything. I do not believe it will grade a road or remove stumps or remove rocks, as some over-zealous advocates claim, but I do believe we can do wonders if we properly locate and grade the earth roads and keep the drag on them. I know we can do it in the South because we do not have the heavy freezes that you have and we can keep our roads in splendid condition if we will only adopt and use it, but we must keep on using it. I am reminded of a story, in connection with this, of a young lady who wrote to Laura Jean Libbey. You know Laura Jean Libbey answers lovesick girls and boys and gives them good advice. She wrote, "I am engaged to be married to a telegraph operator, have been for some time; he lives near where I do and we live about a mile from the depot; during the afternoons of the summer, I have been in the habit of walking with him to his place of business through a skirt of woods. Now fall has come on and it is rather late as we walk to the depot and I am afraid that I will be criticized by people who are inclined to criticize me for walking through the woods with my intended husband. I want to know if it is entirely proper for me to walk through the woods with my intended husband?" Miss Libbey answered: "I have received your letter asking my opinion as to whether it is



proper to walk to the depot with your intended husband and I want to say to you that it is all right to walk to the depot with your intended husband, but keep on walking." I say to you we will have to keep on working our earth roads if we are going to keep them in condition.

There are 2,100,000 miles of roads in the United States that are unsurfaced or rather have not been resurfaced by the hand of man. It would be difficult to ascertain the various soils or natural earths composing the wearing surface of unsurfaced roads. From the finest silt to the hardest granite these roads are composed of and the treatment of one will entirely differ from the treatment of the other.

Until within recent years it was considered next to impossible to make a good road of ordinary earth without surfacing with stone, gravel or other hard material. The absence of suitable material in vast sections of the country and the high cost of it when handled by railroads has forced attention to earth or unsurfaced roads. Unsurfaced roads may be divided into three classes:

First, the ordinary country road opened when this country was young, leading from one settlement to another or from a farmer's home to that of his nearest neighbor. These roads were not opened through any process of law, in fact, there was no law governing roads in those early days, but by following trails of least resistance, removing trees and such rocks as would not permit the axles of wagons to clear, the pioneers of this country made it possible to travel, in a way, from place to place. We have many roads in Alabama now in use that were opened and traveled by General Andrew Jackson, both on his march to fight the British at New Orleans and the Indians in south Alabama and Florida. Of course, such roads were opened hurriedly and little or no attention was given to grades or alignments. Settlers taking advantage of work that had been done built their homes along these military roads or traces as they are frequently called. In the construction now of more modern roads, it is difficult to better the alignment of these roads on account of homes, churches and schools which have been built close to these highways. However, in many places, these roads have been and are being changed to meet the demand of traffic of today. The genuine bad roads of the South belong solely to this class. They cannot be maintained for the reason that they have never been constructed and the great amount of work necessary to keep them in passable condition disheartens the man who by law is compelled to work them. Until these roads are relocated, avoiding heavy grades and marshy bottoms, sharp angles and useless twists and graded so that they will have good drainage, we may expect them to be bad.

The second class of unsurfaced roads are the ordinary graded earth roads which have proper alignment, grade and drainage. The construction of an earth road is simple, but sometimes the simplicity of it causes the average county commissioner or supervisor to overestimate his ability as a road builder. The proper construction of an earth road consists of:

First—A careful inspection by the proper official to determine what beneficial changes in grade and alignment can be made, taking into consideration initial cost and cost of maintenance. The center line and grade of the road should be established by an engineer. After the center line has been established and width of road bed agreed on and grade established, construction work can begin. The proper and efficient grading force for the work should consist of a foreman, eight or ten good two-horse teams with drivers, one wheel and one drag scraper for each team and one extra wheeler and drag for emergencies, one good railroad grading plow, one grading machine, one split-log drag, one dump man and one loader with five or six extra men for grubbing and other work. The foreman should be an experienced grading man who understands handling earth and knows when it is proper to use drag scrapers, wheel scrapers or wagons. The road should be so graded that the ditches or gutters are parallel with the center line of the road and uniform distance from it. When completed the road should be uniform in width and surface should be smooth and even, free from holes and high places with a uniform crown with a fall of 1 inch to 1 foot from center to gutters. On grades this ratio of fall should exceed that of the grade to such an extent that water will readily flow to the ditches instead of down the road. Drain pipe should be freely used and no water should be allowed to flow over the road if it can be avoided. In some cases it is not practical to build the road above high water. In such cases danger signs should be posted showing at what stage the water becomes too high to ford the stream.

We have in the South nearly every kind of soil from sticky gumbo on the one hand to coarse sand on the other. The methods used for improvement of roads through a section of one will not do altogether for the other. The worst roads by far that we have in the South are in our rich and fertile prairie lands, where, unfortunately, there is very little road building material to be found. This soil readily absorbs water and becomes very sticky after rains. It expands freely and dries rapidly when the sun shines and becomes very hard under the tamping effect of teams and vehicles. From observation and experience I have learned that these roads of all others require a very high crown and the driving surface should only be wide enough to allow two vehicles to pass. If a road is narrow with a fall of not less than  $1\frac{1}{2}$  inches to the foot, water will shed rapidly to the ditches and the entire surface will dry out rapidly. A road of this kind can be constructed quickly and at little expense, except where grades are to be reduced or bottoms filled with a grading machine, or even with a split-log drag. The latter method will require more time, but in the end will be found to be very satisfactory. No earth road can be maintained in good condition unless it is so constructed as to drain well and unless it is kept free from ruts and holes.

The third class of unsurfaced road which we frequently have to deal with are those in sections of country where the soil or earth is really road building material, composed either of gravel, sand-clay or



top soil so that when the road is graded it is, in fact, surfaced. Where this condition exists, splendid roads can be built at a minimum cost.

The maintenance of unsurfaced roads is radically different from the maintenance of surfaced roads. For instance, the patrol system used on macadam roads would be entirely inadequate for earth roads. One man can keep up 2 or 3 miles of macadam road where he would unquestionably be unable to keep in good condition a like amount of unsurfaced road. With the use, however, of a team and drag, he would be able to keep in good condition 20 miles of ordinary graded earth road. Some very zealous advocates of the drag claim everything for it, from the removal of stumps and rocks to the ditching of roads. I am a great believer in the drag, but from experience, I know that obstructions must be removed and proper drainage provided for before it is effective. It has been difficult with the road men of the South to convince county authorities that this little machine is of value. The writer when in charge of road work in a Tennessee County inaugurated a system of dragging that proved very successful. Ten roads were graded a distance of 3 miles each. The grading was completed in November. With surface of these roads fresh and loose, it was a foregone conclusion that the winter rains would soften them to the extent that they would become impassable under heavy traffic. Contracts were made with a farmer on each of these roads to keep them dragged during the months of December, January, February and March and the price paid was 30 cents an hour for a man and team. The county furnished the drags. As an inducement to the men to do good work, the county offered prizes of \$25, \$15 and \$10 for the best kept roads. Specifications for dragging and rules governing the contest were furnished each contestant. One important rule was that the prizes would be awarded to the men who kept their roads in the best condition at the least cost. In order that the engineer might keep in close touch with the work, postal report cards were furnished each man and they were required to fill them out every Monday showing the distance dragged, hours consumed and cost for the previous week and mail them to the office of the engineer. In this way it was practically impossible for a dishonest man to render an account for more time than he really consumed without it being detected or if he worked more than was necessary, the reports of the other contestants when compared with his disclosed it. On the other hand if one should be neglecting his work by not dragging sufficiently it was likewise detected. This 30 miles of road was kept in splendid condition despite the fact that two heavy snows fell during the four months. The most interesting fact connected with the contest was the road that was awarded first prize cost the county only \$15 or \$5 per mile.

In many southern States the roads are maintained or at least are supposed to be, by what is known as statute labor, which means a man subject to road tax may work out his tax under the direction of a beat or district overseer. Such labor is practically worthless and



few men are required to work out the stipulated number of days. As it seems to be impossible to entirely abolish statute labor, the question that confronts us now is, what is the best system coupled with this labor to use in the maintenance of our roads. Good results have been accomplished in several counties in Alabama by putting the work in the hands of a few regularly employed foremen who give all of their time and attention to the work, instead of leaving it to many beat overseers who work when it suits their convenience, or do not work at all when it suits them, as it usually does. These foremen are furnished with two or three teams with regular drivers, wagons, scrapers and grading machines, split-log drag and necessary small tools and as many beats or districts assigned to each as he can work. A census is taken in each foreman's territory at the first of the year of all men subject to road duty and he is furnished with a list of names and is required to work every man who has not paid the required amount of cash into the county treasury in lieu thereof. No foreman is allowed, under penalty of dismissal, to receive cash from work hands, but such hands as desire to pay must make their payments to the proper county official at the court house. This method has proven good in most cases, but as a general thing I do not think the best results can be accomplished by permitting men to work out their road tax.

In conclusion I desire to urge that in your effort to better rural conditions by the construction of the main thoroughfares with hard surfacing material, that the branch roads and "side-tracks" be not entirely overlooked.

**THE CHAIRMAN:** The discussion of this paper will be opened by Mr. George W. Cooley, State highway engineer of Minnesota. Mr. Cooley.

**MR. COOLEY:** Mr. Keller has treated the subject of unsurfaced roads so generously, even though he had to draw on the previous report, that there doesn't seem to be anything to criticize. I would like, however, to add to the statements he has made in his paper by quoting something from the laws of the State of Minnesota. You know, just as well as I do, that 95 per cent of the roads in this country that will be in use for the next twenty or twenty-five years are the common, ordinary earth roads, and that is the problem before the people of the South and the people of the West. There are two or three questions involved in the construction, or maintenance rather, of earth roads; first, location, then construction, then maintenance. We will assume that the essential part of the work has already been taken care of, drainage and all that sort of thing. The first point of importance is the question of location, and that came to me very forcibly a few years ago when I was riding over the western part of the State of Minnesota with a friend of mine and we came to a road that seemed to be crooked without any reason for crooks, and

I said, "I wonder what crazy fool located this road?" And he remarked, "He is riding now in the buggy with me." And it appears that that road was developed from the original trail made by me when I used to send my teams back from the prairie camp to the timber to get wood, and as soon as the farmers came into that country, they took this trail because it was the only one to the timber. Gradually it became a country road and now that road has developed into a very important State highway. So it is very important that we should take care and see that the location is so well established and so carefully laid that we won't have reason to change it in three or four years, because that is one of the most important propositions we have in connection with earth roads, the proper location, the construction of the roads. I found in my experience that every man in the West and South that has ever had anything to do with roads knows more about them than anybody else. I found that they all had the best system of roads and understood the question better than anybody else, but in the construction of the common earth roads, one thing is insisted upon in the State of Minnesota, and that is the elimination of everything in the nature of perishable material. I have noticed in different parts of the States some of the good roads States particularly, where dumps are built up from sods placed on the side of the bank to prevent the wash of the slope. That is something we absolutely forbid. We aim to get the material of which our roads are built from the natural soil, discarding anything in the way of perishable material. A gentleman spoke yesterday about the great army of men who had charge of road construction in his State, I think about six thousand, but Minnesota can go that one or two better. We have about two thousand towns in our State; every one of those towns has a road overseer and three road supervisors, so we have altogether, including county commissioners and surveyors, an army of ten thousand men to look after our road business. That is the way it has been up to the present time. The legislature passed a law at the last session providing, among other things, for the abolition of the statute labor tax; we have abolished that and the system of road overseers, so that now, instead of having three overseers or four or sometimes ten or twenty in a town, we have just one. We have concentrated the authority in road construction in the following manner; towns appoint one road overseer who works under the direction of the assistant engineer. The assistant engineer is employed by the highway commissioner and works under the instruction of the State engineer and we have divided the State up into sixty districts and in those we have located the assistant engineer to look after all of the road construction and bridge construction in that district. Under him works the county superintendent of highways, when they have them, and the town road inspector, so we have a uniform system there by which we are achieving the very best results. We have another clause in our law that provides for a



tax of one mill on all the taxable property of the towns for the purpose of dragging; that can only be used for dragging purposes. Then we have in our law another clause which I consider of the greatest importance, with regard to the subject of maintenance; that is, we have a fund for distribution next year of a million dollars and a half, divided up among eighty-three counties. No county is receiving less than 1 per cent of that money, and 20 per cent of the total fund is supplied for maintenance; that is compulsory. The law provides a fund of over \$500,000 for the continuance and maintenance of our roads. As I said, there is nothing to criticize in Mr. Keller's paper and I thank you for your attention.

MR. CLARKSON (of Missouri): I did not expect for a moment to have anything to say with reference to unsurfaced roads, because I supposed there would be a number of other gentlemen who would take up this subject, but inasmuch as there doesn't seem to be any disposition on the part of the others to speak I wish to make one or two entries. The first entry I would make is that it is a subject of importance for the reason that this is the road that many of us have to travel and will have to travel as long as we live, and I believe that these conventions should give more importance to the unsurfaced roads than has been given in the past, because of that fact and because of another fact, which is that when too much attention is given to the surfaced or hard road, it has a tendency to discourage people who must build and must travel dirt roads from doing anything, because there seems to be no attention given to the unsurfaced road; so I feel that it is a fortunate thing that this subject is put on the program and trust that some importance may be given to it.

MR. HOWER (of Maine): As the gentleman has just said, unsurfaced roads or dirt roads are by far the most important we have to consider in this country, and I, for one, would like to see some uniform steps taken toward having better dirt roads. I believe myself that one of the greatest aids in making our dirt roads better roads—we cannot make them good roads—is to have a uniform law throughout our States compelling the use of the road drag. This subject of course has been brought up before, but I find in traveling over the country, that there are less roads not dragged than they are dragged, and there is no doubt to my mind that if the delegates here would take home the value of the drag in connection with dirt roads, that we would have better dirt roads throughout the whole country. I, for one, would like to see a resolution put through by this congress asking the various road commissioners, asking the various legislatures of our States to pass laws somewhat similar to that passed during the past year by the State of Iowa which compelled the dragging of dirt roads, and if it is not out of place, I would move that this convention, this congress, go on record as favoring road

drags and that we ask the committee that was appointed yesterday to take up the subject of uniform road laws for the various States, to incorporate this, if possible, in their report.

MR. CARPENTER (of Wyoming): I wish to say, Gentlemen of the Convention, that that is the one thing that impressed me all the time during the sessions of this Convention, that we are not paying enough attention to the matter of getting our dirt roads in shape. We cannot build hard roads everywhere. There are parts of this country where a dirt road, properly built and maintained, is as good a road as we want and as good as we can get for the next hundred years, even if we want a better road. It seems to me that the thing we are neglecting is the proper dragging of roads that must have a dirt surface, that we cannot get a hard surface on, that is, an artificial surface. It seems to me that we should lay more stress on wide tired wagon wheels, because you can put your roads in the very best possible condition, and after they are put in condition for the automobile, the heavy wagons with narrow tires will run over the road and cut it all to pieces. By using this drag and some means to keep the low places out so that the water won't stand in the road, I am speaking particularly of our Wyoming roads, by keeping that water from standing there, we keep the road good, while, if we leave low places so that a wide automobile tire runs through that water, the dirt is soft and it oozes out to the side and each time an automobile passes, the rut is made deeper. Until we can get hard roads over the United States, we should lay particular stress on this feature of having our roads properly drained and properly surfaced, worked with King drags or something of that sort. If we do that, we are going to have passable roads all over the country. If we do not, we will only have a few expensive roads constructed along some of the main thoroughfares from one city to another. Let us put more stress on that. I would like to hear suggestions; I would like for our engineers to take more interest in studying that feature. While that does not appeal particularly to the manufacturers of road machinery or the manufacturers of concrete and all those things, it does appeal to the man who has to run his automobile over the dirt roads of the United States.

MR. GASH (of Illinois): I was just going to make this suggestion, that I have heard a number of experts talk upon this question of the dirt road, and in addition they lay particular stress upon proper drainage and proper grading of the dirt road, but in addition to that, one of the greatest things you can do for the dirt roads is to work them at the proper season of the year. I daresay, as was said by a man in LaSalle township, in LaSalle County, Illinois, a few years ago when we dedicated a mile of concrete road, he said, "I have lived in this township fifty-two years, ever since I was born, and there has been enough work done on the roads of this township



to have paved them with gold if it had been properly applied." Now, the trouble has been in the past that they have worked the roads at convenient seasons for the farmer. We, in the State of Illinois, have established a tax to be paid and to work the roads at the proper seasons of the year and that is while the soil is wet; so that it forms a hard surface over the dirt roads, if you work the soil while it is wet. Every farmer in the land will tell you that he won't work his soil in the field and cultivate it while the soil is too wet. Why? Because it will become dry and hard and crisp when the dry season comes, but the trouble has been, like in LaSalle County, all over the land, that the roads have been worked when the soil was dry and when the rain comes, it all washed away and the work was destroyed. A proper working, a proper grading, a working at the proper season of the year and a proper grading will make better dirt roads all over the country in every soil of this land.

MR. MYERS (of Ohio): I would like to say a few words in reference to the maintenance of roads, both dirt roads and pikes. I am in favor of legislation that will require proper care in hauling during the springtime or at periods when the roads are soft. Narrow tired wagons and over-loaded wagons hauling, as they do in our county, large engines for the use of oil drilling and gas drilling, those injure our roads in one week or two weeks sufficiently to require adjustment throughout the entire balance of the year. It seems to me that there ought to be a law requiring broad tired wagons, and that this is the time when that should be taken up and considered very thoroughly. It seems to me further that the commissioners should be instructed or some move should be made by this association whereby the commissioners would do their duty in protecting roads that have been paid for by the farmers and others. We were very careless in Ohio and I daresay in other places, in allowing them to be destroyed because of non-attention to legislation or because there isn't legislation that will prevent them from being destroyed after they are made.

MR. SMITH (of New Jersey): I would like to call attention to this wide-tired wagon business; we are not paying enough attention to it. Some States have laws compelling wagons to have wide tires, others taking off the tax if they do have them. We need that more than anything else in the country. In England they have wide tires, the back wheels wider than the front, and you don't find a rut on the roads anywhere. There is no use spending thousands of dollars making good roads and then having them destroyed by narrow tires. The little narrow tired buggy of the farmer's son sometimes does more harm than an automobile. I want to urge that the convention take up this subject, because the time has come when we ought to have broad tires, and we ought to take the matter up and have a national law that will preserve the country roads and prevent their being destroyed as fast as they are made.

MR. STUCK (of Pennsylvania): In reference to the remarks of the gentleman from New Jersey—on the statute books of Pennsylvania we have a law requiring that wide tires shall be used. I happened to be very closely connected with the legislature at the time the bill was enacted, but, as all bills generally are, when it came to the question of a penalty, it was as good as no act at all. In Pennsylvania the roads are spoiled more by the narrow tire than by any other traffic we have got. If the tires were graduated in proportion to the loads carried, the dirt roads throughout the State would be in splendid condition. I would graduate them from the buggy tire up, and for each additional half ton or ton, I would add a proportionate size to the tire. I have seen five tons carried on a less than 4 inch tire. That wagon should have no less than 6 inch tire. I watch these things very closely, having been identified with roads for about fifteen years, and have worked them part of the time and seen our work partially destroyed by one wagon passing over the road.

THE CHAIRMAN: We shall have to bring this discussion to a close in order to finish our program, much as I dislike to do so, and proceed with the next subject, which is "Gravel Roads, Their Construction, Maintenance, Cost and Special Treatment," by Hon. S. Percy Hooker, State superintendent of highways of New Hampshire. Mr. Hooker.

### GRAVEL ROADS, THEIR CONSTRUCTION, MAINTENANCE, COST AND SPECIAL TREATMENT

BY HON. S. PERCY HOOKER

*State Superintendent of Highways of New Hampshire*

What is the province of a gravel road? To what extent are they to be built. What is their economic value and how much credit should be given them as improved roads?

I know that the attitude of heads of departments in States where large sums are available is that of contemptuous indifference to the cheaper forms of road construction. In road building they are in the class of multi-millionaires, who smile contemptuously in their motor driven vehicles at the efforts of the country boy upon his bicycle.

Time was when I had the same view, when it seemed to me in looking over returns from various States that it was somewhat of a travesty to put gravel roads under the heading, improved. It is only a short time since I began to see that in certain localities and certain states they were almost imperative.

Where the mileage of a State was large and the assessed valuation small, I came to the conclusion that it was wiser to build this type of road than the more expensive ones.



In the evolution of thought I am now willing to go much farther and to say that no matter how rich the State, if it has a large mileage of roads, it is advantageous in many places to use this type of construction.

In the present, the people seeing the benefits of good roads, realizing the inconveniences of bad ones and fully comprehending that it is possible by the use of long term bonds to postpone the payment of such improvement, it is comparatively easy to procure large sums of money in any of the richer states.

Whose example are you going to follow, Mr. Commissioner, when a large sum of money becomes available?

Are you going to build a limited mileage of expensive road, where the cost of maintenance will run from \$800 to \$1000 a mile a year?

Is your bitumen bill for your road improvement during the year going to approximate in amount the total cost of your metal and your grading?

Are you going to be satisfied to resurface it at a cost of from \$1000 to \$5000 a mile?

Are you going to build such roads in sections where the cost of the road itself is five times the assessed valuation of all the land abutting on the roadway?

Are you going to place a bond debt which will approximate  $1\frac{1}{2}$  to 2 per cent of the entire valuation of your State and then be satisfied with an improvement of one mile in five of your highways?

Will you be satisfied with a maintenance bill which entails from  $1\frac{1}{2}$  to 2 mills per annum on your entire assessed valuation and then leave four-fifths of your highways unimproved and without any assistance from the State in maintaining?

This is in general the attitude of the State authorities who have sufficient money available to class them in the "Four Hundred" of road building.

From their point of view there is absolutely no value in a gravel roadway, so far as the State departments are concerned.

Where they can get the various towns, or counties, or boroughs, or whatever the unit of recognition may be, to build this class of road without expense to the State the "Four Hundred" may advise it, but it is contemptuously brushed aside as being of no value to the department. This attitude leads me to ask the question, what is the economic value of a gravel road?

I personally belong to the class of the meek and lowly. The class of which the Bible says, "The poor ye shall always have with ye," and it is an impossibility for the State which I represent to consider for a moment the question of average expenditure per mile of road, which is considered and accepted in many of the richer States.

We are obliged to turn to the cheaper class of roads and this necessity has changed my attitude as to the general proposition. I formerly had the same feeling that I know now maintains of the "big fellows," as to any talk about the use of gravel, unless the

gravel is mixed with such a volume of bitumen as to take it from the cheaper class and make it practically a bituminous road. I do so no longer.

No matter what the financial condition of the State, no matter how much money is available, I think there is a large per cent of the road mileage of the State that should be improved and maintained as earth or gravel roads.

When the initiative for the construction of a roadway lay with the local sub-division, town or county, the weakness of the law requiring this was shown by the lack of continuity and the short pieces of highway, or any through route, which were interspersed among the bad sections. The local interest called for sections which were no part of a continuous highway and it seemed that the State must select certain routes which practically must be paid for by the State or at any rate only a small percentage by the locality. This provision temporarily seemed to fit the situation. You had provided for ready access from one center of population to another, so that the tourist, who, through the advent of the motor vehicle was becoming a large factor in the road traffic, was able to travel upon an improved highway wherever he was likely to desire to.

Right at this point is where the executive heads of the departments failed to comprehend their opportunities for the general good. Here was the opportunity for estimating the value of the road as an economic proposition as compared with its value as a pleasure route. So far as I know, every executive confronted with this situation made the same error. They all failed to consider that a road which was practically little used except for the summer season could be made satisfactory during that season with an expenditure of only one-quarter of what would be necessary upon a road with heavy local traffic, which would be used as much in the spring and late fall months as in the summer.

Roads were built in thinly inhabited sections of the same class and quality as where the traffic was through a thickly inhabited section.

One-quarter of a million dollars was spent in a section of a certain State for building a highway, 95 per cent of the traffic on which was comprised within four months in summer. In another State a 2-mile section of road was built at a cost of not less than \$25,000, in the middle of a swamp 8 or 10 miles long and which was practically impassable to traffic.

From a casual inspection, I believe, to make it available over \$100,000 more would have to be expended and then on its entire length there were not more than ten residents. The local traffic on this road would not justify the expenditure of any State money. I do not believe that all the produce hauled over the road would sell for enough to pay the interest on its cost, leaving aside the cost of the maintenance of the road which I do not think could average less than \$500 per year, per mile.

The only justification for this road was through traffic and I personally think that had the amount of money expended on this



2 miles been spent on cheaper construction on the entire roadway it would have been an equally satisfactory road for tourists and the money necessary for the maintenance of the 2 miles would have kept up the entire 10 miles if built of the cheaper construction.

We all of us know that the automobile is the chief factor in the creation of the sentiment for good roads. We appreciate what they have done for the general system but among the automobilists themselves there is a constantly increasing demand for more roads which are satisfactory to drive upon and they are no longer satisfied with one route between two points. They must be able to go by one route and return by another. They do not want the sameness of continuously driving over one road. This being so, why not combine the desires and wishes of the local people, who wish to use the roads for business and of the autoists, who wish to use them for pleasure.

Had the heads of the highway departments at the time when the large sums of money began to be available adopted the policy of providing more miles of reasonably good road, rather than the limited mileage of the highest class road there would certainly have been little or no difficulty with the motor vehicle driver.

A road maintained so that it was a smooth, easy driving road would have fully satisfied him.

Have you educated him to the idea of such expensive roads that he will not be satisfied unless he gets them? This is a question I am unable to answer.

Build your road for the local and wheel traffic primarily, build it as expensively as you desire, build it substantially and then connect this piece of road with the next piece which requires the same sort of construction by the cheapest methods in which it may be satisfactorily maintained as a summer road.

A permanent highway in any place where your local traffic demands the high and expensive type of construction must be a pavement. It may be brick, it may be concrete, but it must of necessity be of a greater efficiency than most of the types of roadway, which we are now building.

The question of financing road building up to the present time has been largely a question of borrowing money enough upon long time obligations to complete the road, but we are rapidly approaching the point where, from the multitude of obligations assumed, the question will be, how can these obligations be paid, rather than how obtained.

My general conclusion, therefore, about gravel roads is that their economic value is such that four-fifths of all the road work of a State should consist of the class of roads, which we call—gravel.

I know the answer which so many department heads make to me. "You have gravel and can build such roads, but how are we to do so?"

When I use the word, gravel, I do not necessarily mean a combination of sand and water washed stone, which is commonly and generally considered as gravel. I mean any combination of material which contains not less than 60 per cent of metal, in shape and size

so that it need not be crushed, whether the binder be true sand, clay or marl.

If the binder is of the latter, it must contain a larger percentage of metal than if composed of either sand or clay. The question of gravel to me means that you have an aggregate containing stone which will from its own disintegration form a binder or one to which some material must be added which is adhesive in wet weather and in drying forms a covering or shell firmly binding the metal together.

I believe there are few localities east of the Mississippi River which do not contain large quantities of such material. The sandy gravel may be some little distance from the necessary clay binder but I believe within a reasonable distance it may be found, at least in all the eastern States.

#### CONSTRUCTION

Whatever road is built the fundamental proposition is the drainage. If you are building on a sand foundation, this is not so vital a point as where you have an impervious clay subsoil, but even with the sand the water must be provided with channels to keep your road dry or it may develop that the fine sand which in dry weather you were obliged to fairly plough through in wet weather may act as a sort of quick sand with as bad a bottom as that of a clay road.

The width of your road should be the same whether built of gravel or of bituminous macadam. The quality of your gravel, as I have said, may vary to a certain extent. You must determine from its character whether it needs an additional binder. In the run of most gravel pits there is a percentage of stone which is too large in size to use in the surfacing proper. This may be used as a foundation either on sand or in wet clay holes. It is really required under either of these conditions.

It is not as requisite to use a telford specification where the surfacing is to be of gravel as it is under a macadam but when these larger stones are used they should be laid with some regularity and telfordising. That is, brought up to a comparative grade. The same specifications as regards embankment and fill should be used as would be with the macadam or bituminous road, except that much less care need be used in shaping your shoulders prior to putting on the gravel. If your gravel pit is particularly "bony" it may be necessary to screen the same but except for the top surface I do not consider it usually imperative. Stone up to the size of 3 inches in diameter may be used in the bottom course.

The road should be graded so that your final cross section will show an inch to the foot grade from your ditch line. Two methods are perfectly practical and in general use in starting the construction. One is to build the shoulders of other material and place the gravel so that when rolled it is 8 inches in depth over the metalled surface of the road. The sub-grade of the metalled surface will then be same as final section, 1 inch to the foot.



I prefer to leave the rough grading on a section showing 3 inches rise on 10½ feet, as the roads we build are largely 21-foot roads, and the gravel showing 10½ inches in the center and 3 inches on the outside edge of the road. This reduces the average thickness of your road on the metal part but gives a gravel shoulder which is invaluable in the maintenance. It also gives the 5 feet in the center, upon which the major portion of the travel always is, a depth of about 10 inches, instead of 8. In the maintenance, also, it prevents the growing of grass on the shoulders and makes the effect of the road much better.

The gravel should be laid in two courses. This is especially necessary on the first section spoken of in order to get proper compaction, though in the second section it is not so imperative provided the gravel is self binding and is all shovelled over on a dumping board or the load dumped far enough ahead of the work so that it must needs be completely forked and shovelled over. Where laid in one course it is very easy to spread the gravel so that the larger stones are all in the bottom of the road, keeping ahead of the work in this way and leaving the surface composed of your finer material.

If a binder is to be used consisting of clay or marl you must lay in two courses besides the binder or an equivalent of three courses as the bottom course of about six inches loose should be covered with an inch or so of your clay and then a top course applied.

Sometimes it is possible by the use of a harrow to work this clay course thoroughly through the top surface and where this can be done it should be. In practical construction it sometimes works out better to have your bottom course somewhat thicker and your top course somewhat less with the clay binder in between.

The adjustment as to the amount of the clay is largely a matter of experience. No exact rule can be given as to the amount of clay to be used, but a man familiar with the building of roads can usually tell in most cases how much is necessary to thoroughly bind it.

When there is water available and the road can be kept wet before being rolled it is easier to adjust the quantities. It must be remembered, however, that sprinkling the road in many places is an expensive proposition and as the whole theory is to obtain a road which shall be built at a small cost it is frequently possible to obtain rain enough on the road so that it may be built without the use of the sprinkler.

This summer has been extremely dry and it has been very difficult without the use of additional water to compact the road sufficiently. For a considerable time after completion the roads upon which no water has been used have failed to "come together." I find, however, that a good soaking rain will in many instances allow a considerable section of soft road to compact very readily and where the water for wetting the road must be drawn a long distance it is practically wiser to build the road without such water.

You will understand that I am talking the gravel road as a cheap road and that anything that tends to make it approximate in cost, a broken stone road is to be avoided.

The quantity of gravel which is used in the construction of these two types of gravel road figures as 37.04 yards per 100 feet compacted which will require from 42 to 45 yards of loose gravel in building a one course road and something more in a two course, the amount necessary to haul upon the road depending to a considerable extent on the quality and constituent parts.

#### COST

The cost of gravel roads will vary to a greater degree than that of either bituminous or water bound macadam. The reason is that the actual cost of your material in the higher types of construction is fixed, while in the gravel road the cost in the pit compared to the cost in the furnished roadway is almost negligible.

The price of your gravel may be only 5 cents per cubic yard and its cost is fixed by the average haul. With the material situated on or very near your roadway the cost of your gravel construction may not exceed from \$1600 to \$2000 a mile, while with the material compelling a 2-mile haul it may run up from \$3000 to \$3500.

Assuming that your grading and drainage is upon an average \$1200 per mile, you have your total cost of the road per mile running from \$2800 to \$4800. The average of all the gravel roads built, in the State which I now represent, has approximated \$3900, including the grading.

It must be remembered, however, that a considerable per cent of these roads are in sections absolutely remote from any railroad facilities and the cost of the more expensive class of road would be far higher than the average in states where the railroad facilities are better.

For instance, in one town, where we are building, the railroad station is about 40 miles and the cost of delivering bituminous material upon that road would be almost as much as the cost of the material itself at the railroad station.

The rock in this particular town, while available in quantity all along the road is of such a quality that in crushing the native stone you would practically procure 50 per cent of unavailable dust to say nothing of the probability that under a roller your grades of stone would crush down into dust. I do not think that a bituminous road with imported stone could be built for less than \$30,000 a mile in this particular town through which one of our trunk lines runs and 95 per cent of the traffic is summer traffic. The total population of the town is only 211 people and the total mileage of our trunk line through the town is 13 miles.

This 13-mile road when finished will not cost to exceed \$40,000. Would the heads of departments who look with supercilious scorn at



calling gravel roads, improved roads, think that the expenditure for other types of roads was warranted?

#### SPECIAL TREATMENT

From my point of view when the ferment for good roads, that is now agitating the road builders and the general public has subsided and the resultant wine has been carefully quaffed there will be little or no special treatment for gravel roads. The road will be kept as a gravel road with no masquerading as a different type. It will only be used in sections where the dust nuisance is not intolerable and the attempt by treating the road to make it an actual competitor of its higher priced neighbors will cease.

I do not believe that it is possible to convert a cheap road into an actual competitor of pavement by any treatment. Two forms of such treatment have been experimented with with more or less success.

Naturally with the coming of bituminous roads of the macadam class it was hoped that by the use of the same bituminous materials equally as good results might be obtained on gravel roads.

It was soon evident, however, that very little was saved by the attempt to use gravel in place of crushed stone in combination with bitumen. In order to make a satisfactory aggregate the gravel must be screened into several sizes and the natural binder must be eliminated.

The cost of handling the gravel and combining it in proper proportion was such that there was no lesser cost than in using macadam. The roads as a whole were not as satisfactory for two or three reasons.

First, it was almost impossible to get your aggregate clean enough so that the substituted binder in the way of bitumen adhered closely to your metal. The metal used was without clean cut breaks and fractures and did not as readily ally itself with the bitumen.

In certain cases where a clean sandy gravel could be obtained there were good results so far as the construction of the road was concerned but little saved in cost.

Naturally the next step was to attempt to apply the blanket treatment, using the bitumen on top of a gravel road. I think one of the faults of this treatment is that the untreated road if constructed properly contains the same native binder, which interferes with the construction of a bituminous road. This treatment, has in many instances, been a satisfactory one. I think it is impractical to treat with as heavy an oil or tar as can be used on a macadam road but the bitumen known generally as from 50 to 60 per cent class, applied hot and requiring a cover, in many instances proves satisfactory.

There is a tendency, however, upon these roads to develop holes and pockets, arising probably from the fact that a gravel road is not a homogeneous one but is of itself composed of the metal, not properly distributed, mixed with a fine aggregate which we generally know as sand.

There seems to be a peculiar failing of these roads from the fact that when the crust which you have applied is broken it rapidly disintegrates around the hole. There is only one method of treating such a hole. It must be immediately attended to by the patrolman with a combination of bitumen and gravel or in other words it must be "patched." By immediate attention, if the holes as they appear are filled there need not be any considerable added charge to your maintenance.

One great objection to this form of treatment is, however, that it is impossible to use the road drag and bring your road back into section as you do on the untreated gravel road. The distinct tendency of a gravel road is to flatten and get out of section much more rapidly than a macadam road and unless you continuously and after every rain bring this road back to section it is not a satisfactory road. The chief objection is that you are adding materially to the cost of maintenance as it will cost not less than \$400 per mile in addition to the patrol charge which will of itself be fully as large as an untreated road.

Variations of this same idea of surface treatment are made by the application of light oils and tars which can be applied cold and without the addition of farther material. In some instances these seem to be effective and satisfactory. The surface after application and under automobile traffic has in certain cases "rolled out" so that you have a fair imitation of an asphalt road, particularly in the wheel tracks.

The tendency is, however, that where there is considerable horse traffic the action of the horses hoof tends to "meal up" the road.

I have not been able to analyze for myself the exact reason for the difference in result on these roads, but in most instances I think that the lighter oils on gravel roads only act as dust alleviators. The cost is cheaper than the other treatment and where there are a large number of people living along the road it is imperative that something be done to render life liveable and the dust held down in some manner.

On my general plan, however, of building gravel roads only where the local traffic of itself would not require a better class of road, I should have comparatively few residences on a gravel road.

The only other form of special treatment that I have used is with the by-product of certain pulp mills. This is claimed to have a chemical effect which makes practically a monolithic stone of a gravel road. I have had little experience with this treatment. I have in mind two roads, one of which is apparently a perfect success and the other, I believe, to be practically valueless, and not as good as though the product had been omitted.

Were this treatment uniformly successful, however, the added cost would be such as to bring it in the high cost class, rather than the cheap gravel road. The use of the heavy oils or this treatment may be valuable on a class of road which lies between the class



indicated for a permanent pavement and the summer road with a cost between the two but I think that the safer way at present would be to give the pavement the benefit of the doubt and use your sand and gravel in concrete construction and thus be sure that you had anticipated the future building.

In this talk about special treatment I have used one or the other of these methods for a large number of miles of gravel road and the question might well be asked, why if you use it do you not recommend it? My answer is that the gravel roads, which are thus treated are in sections upon which I do not consider the gravel construction advisable. They are in localities which have a considerable amount of local traffic. A pavement of some sort is evidently required in many of these sections but the gravel road is there and we have not had money enough to replace it with a pavement. It is, therefore, unquestionably necessary that we do the best we can towards making the roads so treated take the place, so far as possible, of the better type of road, which should have been built in the first place.

#### MAINTENANCE

A year ago at this convention I talked for some time on the question of the maintenance of gravel roads. Another year's experience has confirmed my statement that, under the patrol system, a gravel road could be maintained in excellent condition at a cost of not more than 25 per cent of the cost of the maintenance of the higher types of road.

This last summer has been an extremely dry one, the precipitation being only three-fifths the normal in New Hampshire. In the construction of gravel roads the lack of moisture is a very serious thing, and I must concede that throughout the summer this class of roads, as a whole, has not been in perfectly satisfactory condition.

This is especially true where the material used contains an added binder and will not of itself bind it. Where clay or marl was used as such a binder and no rain fell for a period of five or six weeks the tendency of the binder to pulverize and become a very fine product on the surface of the road resulted in the loss of a considerable per cent of this binder with a tendency to expose the metal in the top course. This was especially noticeable in a road which had considerable wear prior to this year where the finer particles of metal had been worn and somewhat disintegrated.

Notwithstanding this fact, the roads maintained under a patrol system were in comparatively satisfactory condition during the entire summer. The roads built during the summer, being absolutely new and not fully compacted before the summer traffic began, lack also the finish or coating which makes them ideal automobile highways.

The heavy rains recently have made it possible, however, to bring them into almost perfect shape by the use of the road drag, and I have no reason to doubt that next summer under proper maintenance they will be again the "ideal" motor roads.

Experience showing that constant patrol is absolutely necessary also confirmed my views that the patrol system of itself is not enough to properly maintain the highways.

I suggested that the ideal system of maintenance was by the use of a repair gang or a flying squadron who should do the preliminary work in the spring necessary to put the road in good condition before it was turned over to the patrolman for his exclusive care.

All the roads which were handled by this system early were maintained so that at this date they are in better condition than when the patrolman started the care of them in May.

On the contrary, the roads which were not in first class condition when the patrolman began work have required throughout the summer more or less extra repairing.

In practice, whenever the repair gang did not repair the road and wherever the patrolman was not able to show an improvement in his road I have authorized him to procure for a given number of days additional assistance. This adds somewhat to the cost of maintenance and in some instances we have not been able to secure good men for such temporary work.

In almost every case the assistants hired have no special knowledge of the work required and therefore are not as efficient as though they were regularly employed in a repair gang. Their efficiency depends almost entirely upon the patrolman. If he is not an extraordinarily good man his tendency is when his road is not entirely satisfactory to ask for farther assistance. He loses somewhat the pride which comes from having maintained his road by his own efforts in better condition than that of the adjacent patrolman.

The patrolman, himself, is the key to the system and you must awaken his pride as to the condition of his road in order to secure the greatest service. There is a vast difference in the capacity and the pride of the different patrolmen. As "Stars differ among themselves in magnitude," so do the patrolmen differ in their work. If upon him alone devolves the care of the road and its condition he works far better than with the feeling that you do not expect him alone and unaided to do the work. It is certainly advisable then to form a repair gang under a foreman whose duty it is to do the heavier work necessary on the road.

In practice we used the repair gang during the middle part of the season as an oiling gang, so that their work at the beginning and end of the season was repair work pure and simple, while during the larger part of the summer it was engaged in oiling.

Referring again to the subject which I have considered under "Special Treatment," wherever a gravel road has been previously built on a section of road which from the development of traffic has been shown to be inadequate. I have used the repair gang in the reconstruction of the road to make it of a different and higher type.

I do not think there is any better foundation for a semi-paved road than a worn gravel road. In building a bituminous top for



such a road the quantity of metal and bitumen to be used need not be more than two-thirds the amount required in ordinary building such construction and your foundation having "found itself" is much less likely to prove deficient in anyway.

This is a strong argument for the use of the gravel construction in cases where you are unable to determine which type of road is actually required. You may find that you require the pavement class where you have originally thought that the cheaper construction would do and if so, in changing the construction, you are not adding materially to the cost of the road when reconstructed and are thus able to correct an error without any additional expense.

I have not changed my mind in regard to the organization of a maintenance system. Starting with the "overhead" the division of the maintenance into units of about 100 miles in charge of an inspector, the sub-division into patrol lengths of from 6 to 8 miles in charge of the patrolman seems to me to be the only practical system.

I have not changed my mind as to the advisability of separating construction and maintenance, though I realize that the concensus of opinion is against such division. It is easy to say that any faults of construction developing after the completion of the road should be taken care of by the same man who superintends the construction. Practically, however, the "faults of construction" as compared to the wear of a road are infrequent.

The qualifications for an engineer of construction and for a superintendent of maintenance remain in my mind as diverse as ever. The construction period will in most instances not be exactly the same as the maintenance period. You can not expect that one man in charge of both construction and maintenance will have the same pride in the latter that the man who has sole charge of this will feel.

I have said nothing as yet as to the actual maintenance to be used on gravel roads as distinct from other types of construction. The special advantage consists in the adaptability of the road drag or hone to this work, the availability of the material for repair and the low cost of resurfacing. On a gravel road with material fairly available the cost of 4 or 5 inches of gravel upon the road will not exceed \$500 and with a patrolman on the road such resurfacing will not be required for eight to ten years after construction. The yearly resurfacing charge as distinct from patrol maintenance will only be \$50 or \$60 per mile, while the resurfacing of other types of roads will probably require at least ten times that amount. The patrol cost will not be more than \$100 per mile and the repair gang will not average over \$50, so that the total maintenance charge over a series of ten years will not be more than \$200 per mile.

Compare this with an estimate of from \$800 to \$1000 per mile and then compare the resultant road through the same period and it seems to me that the question as to the advantages of a gravel road has been answered.

I do not take myself seriously enough to suppose that a warning from me will change the attitude of anyone in regard to the building of highways in the respective States.

It is, however, in my opinion the greatest menace to the good roads movement that exists today. With the average cost of improved roads \$11,000 to \$15,000 a mile, with an average charge for interest on the investment of not less than \$600 per mile, with the maintenance estimated at \$800 per mile, when the day of reckoning comes and the small tax payer realizes the cost to him, how can you persuade him that economically he can afford to encourage the expenditure of such sums upon a limited mileage in each State?

He may never ride or drive upon an improved highway. He may still convey his produce to market over a road knee deep with mud in the spring time and yet he will be asked to add to his tax bill a sum which he figures approximates 2 mills for such highways. He is eventually going to ask, is it worth it?

The slogan of "Good Roads" has accomplished much. The demand "Better Roads" has made itself felt, but before the movement attains its culmination my impression is the cry will be, "More and Cheaper Roads," rather than either of those so prominently before the public.

**THE CHAIRMAN:** The discussion of this paper will be opened by Mr. Leonard Tufts, of Finehurst, North Carolina, who will also explain his experience in the construction of sand clay roads. Mr. Tufts.

**MR. TUFTS:** There was a gentleman here from Maine who made the remark that you can make good roads of earth. Mr. Hooker says that the gravel roads are pretty good. For our section, in North Carolina, the earth roads are the best roads. But where they are the best roads, they are maintained and properly maintained.

Many think of a macadam road as a permanent road. The harder the surface, the more expensive a road is, as a rule, and the longer it will stand in good condition without attention. Eventually, however, it will have to have attention, and when this time comes, the expense of repairing is a great deal more than in the case of the softer materials.

The majority of people do not consider the sand clay top soil, gravel and earth roads good because they are seldom maintained. The dirt roads must receive attention every day in the year, whereas the harder roads can be left for a year or more and be fairly satisfactory. The cost of looking out for the dirt roads per mile is very small, but repairs must be made as soon as they are needed. The 250 miles of roads in my vicinity in North Carolina that Mr. McQueen my assistant, and I are maintaining, are not looked out for as well as they should be, because neither of us devote the time we should



to do this work properly. We probably do not devote more than a day a month to this work. At the same time the automobilists who come there frequently tell me that they are the best roads they ever drove a car over. One enthusiast from Massachusetts told me that one stretch of 30 miles was better than the Lynn boulevard. This particular stretch of road was built largely by contributions from people along the road and did not cost over \$9000 for the 30 miles, did not cost over \$300 a mile. The Lynn boulevard probably cost \$20,000 a mile.

Many of the roads are poorly located and the grades are too steep; they do not even look like roads, and, as some of the engineers here who have seen them will tell you, they exemplify everything that is bad in road construction. At the same time, there is so much good roads enthusiasm in our section that the road supervisors, although they have money in the treasury, never consent to build any roads unless the people will subscribe half the cost of building, and even with this stipulation the greatest difficulty we have in that section is to restrict construction of roads.

We have now in Mineral Springs township, between 40 and 50 miles of road and a road tax of 25 cents on \$100, which raises about \$2000 a year. From this you can see that the section is poor and is sparsely settled. Automobilists are well pleased with our roads; the farmers and the merchants of the section are proud and enthusiastic over them, because they are well maintained, and these roads are maintained at an expense of \$30 per mile a year.

There are thousands of miles of roads in the United States that can be made equally satisfactory, and I claim that greater attention should be given to this subject. With us, two men with a pair of mules are given a section of road varying from 20 to 30 miles. They keep the gutters clean, keep the bushes cut back, haul any surfacing material where necessary and drag the roads in their section after a rain and only after a rain.

Each of the farmers along the road who have two or more horses are given a road drag which costs us about \$2.50 a piece. We select one of these for about every 8 miles to attend to the dragging after a rain, and if the roads need it, these men are instructed to drag their section. If we find the roads need it badly and the regular man has not been attending to it, we telephone to another man that has a drag and ask him to drag it. Every time a man drags the road, he sends a bill to my office and receives a check for the labor of his team and himself. In some sections, we find it easy to get a man to drag; in others, there is considerable difficulty, but we are getting to look out more and more.

## THE SAND-CLAY ROADS MAINTENANCE IN NORTH AND SOUTH CAROLINA

BY LEONARD TUFTS

No State in the United States can afford to have all roads macadamized or hard surfaced. I know that this is not the opinion of many road enthusiasts, but if you will look at the mileage of highways in each State and compare this with the taxable property in each State, and then consider the interest on the cost of these roads as well as the cost of maintaining them, I think you will agree with me that my first statement is correct. I find, from a bulletin published by the office of public roads this year, entitled "Repair and Maintenance of Highways," that the cost of repairs and maintenance of the State highways in Massachusetts in 1912 was \$676 a mile, and that the average cost of repairing and maintaining in Connecticut, Massachusetts, New Jersey, New York and Rhode Island for the last eight years was \$608 a mile, and even at this high cost the State highways in these States are not maintained as well as they should be. In the same pamphlet I find that the cost of maintenance in England, where labor is cheaper than here was \$415 a mile in 1910. In France the cost was \$347 in 1909. It is evident from these figures that the cost of maintaining a first class macadam highway in this country would be at least \$600 a mile. The taxable property divided by miles of road in Massachusetts and Rhode Island gives these States approximately \$250,000 of taxable property per mile of road. If the tax rate is 25 cents on \$100 this will raise \$625 a mile for all roads which is hardly enough to maintain them if they were all macadam, to say nothing of the interest on the investment, which would be at least \$300 a mile. If all of the roads in these two States were macadamized the interest on the investment and maintenance would necessitate a tax of 40 cents on \$100. New York State is next to Massachusetts and Rhode Island, and there they have about \$150,000 of taxable property per mile of road. There it would be necessary to have a tax rate of 60 cents per \$100. The other States have so little taxable property per mile of highways that it hardly seems possible to build any hard roads. Of course, if all of the roads in the different States were as fine as the roads in England and France there would be a great deal more taxable property, but I can hardly conceive of any State in the United States increasing its taxable property enough, with the exception possibly of Massachusetts, Rhode Island and New York to pay for the maintenance of their roads and interest charges. I think you will agree with me, therefore, that for years to come the roads in the United States, with few exceptions will necessarily be of some cheap construction.

I wish to make another statement. The average cost of repairing and maintaining a road is approximately 10 per cent of its original cost of surfacing. This figure is an average figure, and an approximate figure, but in my investigations it is surprising how often it comes out



right. From all that I can learn the surfacing of the State roads in Massachusetts, Connecticut, New York, New Jersey and Rhode Island, is \$6700 a mile; the average cost of maintaining—as I called to your attention before—is \$608 a mile, and if properly maintained would cost \$670. In North and South Carolina Mr. McQueen, my assistant, and myself have the maintaining of some 250 miles of gravel and sand-clay roads. These roads cost for surfacing approximately \$300 a mile. Labor is cheap and material is convenient. The cost of maintaining these roads is within a few cents of \$30 a mile. The cost of surfacing several gravel roads that I know of has been about \$1500 a mile; from all that I can learn, the cost of maintaining has been approximately \$150 a mile.

Many think of a macadam road as a permanent road. The harder the surface, the more expensive as a rule, and the longer it will stay in good condition without attention. Eventually, however, it will have to have attention and when this time comes the expense of repairing is a great deal more than for the road of softer material. The majority of people do not consider the sand clay, top soil, gravel and other dirt roads good because they are seldom maintained. These dirt roads must receive attention every day in the year, whereas the harder roads can be left for a year or more, and be fairly satisfactory. The cost of looking out for the dirt roads per mile is very small, but repairs must be made as soon as they are needed. The 250 miles of roads in the vicinity of Pinehurst, North Carolina, that Mr. McQueen and I are maintaining are not looked out for as well as they should be, because neither of us devotes the time that we should to the work; probably not more than one day a month. At the same time the automobilists who come to Pinehurst frequently tell me that they are the best roads that they have ever driven a car over. One enthusiast from Massachusetts told me that one stretch of 30 miles was better than the Lynn Boulevard. This particular stretch was built largely by contribution of the people along the road, and did not cost over \$9000. The Lynn Boulevard probably cost \$20,000 a mile. Many of the roads are poorly located; many of the grades are too steep—they do not even look like roads—and as some of the engineers here who have seen them will tell you, they exemplify everything that is bad in construction. At the same time there is so much good roads enthusiasm in our section that the road supervisors although they have money in their treasury never consent now to build any roads unless the people will subscribe half the cost of building, and even with this stipulation the great difficulty we have is to restrict the construction of roads. We have now in Mineral Springs Township between 40 and 50 miles of roads, and we have a road tax of 25 cents on \$100, which raises only about \$2000, a year. From this you can see that the section is a poor one and sparsely settled.

Automobilists are well pleased with our roads there. The farmers and merchants of the section are proud of and enthusiastic over the roads because they are well maintained. And these roads are main-

tained at an annual expense of \$30 a mile. There are hundreds of thousands of miles of roads in the United States that can be made equally satisfactory and I claim greater attention and greater study should be given to this subject by people who are interested in the road, than to the harder surfaces.

With us two men with a pair of mules are given a section of road varying from 20 to 30 miles. They keep the gutters clean, keep the bushes cut back, haul on surfacing material where it is necessary, and drag the roads in the section where they happen to be after a rain. Each of the farmers along the road who have two or more horses are given a road drag, which costs us about \$2.50. We select one of these for about every 8 miles to attend to the dragging. After a rain, if the roads need it, these men are instructed to drag their section. If we find that the road needs it badly and the regular man hasn't been attending to it we telephone another man that has a drag and ask him to drag it. Every time a man drags he sends in a bill to my office and receives a check back for the amount of labor for his team and himself. In some sections we are quite successful in getting men to drag at the proper time, and in other sections we find considerable difficulty, but we are gradually getting more and more men to look out for this work.

In many sections of the United States there is some material that makes a good cheap road, and if a competent man and a pair of horses are kept on this work continuously under the direction of some intelligent citizen, and if the road is dragged frequently, you will find that the expense on these earth roads is very small per mile, and that they will be satisfactory for twelve months in the year in most places, and for the greater part of the year in others.

MR. SMITH (of New Jersey): We are not paying enough attention to the matter of cheaper roads in this country. I drove from Miami, Florida, to Philadelphia, and passed over every kind of roads, and it is possible and is good policy for us to take up and give more attention to the cheaper roads in the country and see how they can be made better and protected, rather than spend all our money on these high priced roads of cement and brick and asphalt and water bound macadam and all the rest. They are all right for the cities and great highways but not for the country roads and I am sure that this matter of gravel and sand clay roads ought to be taken up more thoroughly by the Convention.

A MEMBER: I want to make an entry for competition. in Jasper County, Missouri, we have 600 miles of gravel roads. You can go there with your automobile today and break the speed limit without vibrating your springs. They are kept that way by continual dragging with traction engines and drags weighing two or three thousand pounds. We drag 10 or 12 miles a day with those engines.

A MEMBER: I would like to ask Mr. Hooker if they roll gravel roads in New Hampshire?



MR. HOOKER: We do roll them, we roll them with regular ten-ton rollers, where we have them. In some instances we have got to roll them with a corrugated roller drawn by oxen, but if you haven't got a corrugated roll, you can put your road in just the same condition after a rain by the use of a drag.

MR. HILLIARD (of Michigan): I want to say that the experience of the road builders in upper Michigan confirms all that Mr. Hooker and Mr. Tufts have said regarding gravel and dirt roads.

MR. ATKINSON (of Louisiana): How do you apply your gravel?

MR. HOOKER: I put my sub grade on the 21 foot road 3 inches higher than the finished.

MR. ATKINSON: Do you have a shoulder or apply the gravel the entire width of the road?

MR. HOOKER: I prefer it without the earth shoulder, giving the gravel the entire width of the road. The other way, we build a shoulder and 15 feet of gravel 8 inches thick, 11 inches in the center and 8 inches on the outside.

MR. EBERHARDT (of Pennsylvania): We take the road machine first and grade the road, then haul the gravel 4 to 6 miles, place it 6 to 8 inches deep with the dump wagon, spread this from the dump wagon, use rakes and thereby get at the lumps and make an even and good grade of road. It costs \$1600 to \$2000 a mile and it can be maintained three to four years at an average expense of \$200 to \$300 a mile.

THE CHAIRMAN: If there is no further discussion, we will proceed to the next subject on our program. Colonel Stevens is not here, but his paper on "The Treatment of Wornout and Ravelled Macadam Surfaces" will be discussed by Hon. Robert C. Terrell, State commissioner of public roads of Kentucky.

## TREATMENT OF WORNOUT AND RAVELLED MACADAM SURFACES

BY COL. EDMUND A. STEVENS

*State Highway Commissioner of New Jersey*

Before discussing the cure it is well to define the trouble, and to analyze its causes. The word "ravelling" is used rather loosely. For my purpose I shall consider it as the loosening of the bond of a road surface until the macadam stone lies loose and free on the road. By macadam stone, I mean, not the small stone used to fill voids and give a smooth finish to the surface, but the stone that con-

stitutes the body of the road's surface. In macadam work this stone when compressed to its final form occupies about 60 per cent of the volume of the road surface. The 40 per cent of voids is filled in varying proportion with surface stone, screenings, stone dust, sand, earthy materials and any chemical binder used to "hold the road." The mixture of fine stone, sand and earth filling the voids has no appreciable tensile strength. Its duty is to wedge the macadam stone in place and prevent internal movement. Such a structure is called on to carry loads, to receive and absorb propelling thrusts. The road should be of sufficient depth to transfer the stresses thus imposed to the sub-base without serious internal movement and at unit pressure less than the resisting power of the soil. It is thus subjected to vertical and horizontal forces that contribute largely to ravelling.

Let us briefly consider these.

A draft horse weighing 1200 pounds will have all his weight at one time on two feet. He will exert say 1 h.p. at a speed of 4 miles.

The vertical forces at the foot is 600 pounds, the horizontal  $\frac{23,000}{2 \times 4 \times 88}$   
 $= 47$  pounds. These forces are or may well be concentrated on a toe calk 2 inches in width; the resultant force slightly exceeding 300 pounds per linear inch.

A motor truck weighing, loaded, 16,000 pounds and exerting at the wheel rims say 30 h.p. at 10 miles an hour, will with 60 per cent of load on rear axle, exert a vertical force of 4800 pounds and a horizontal of 562.5 pounds at each rear rim, the resultant being about 800 pounds per lineal inch for 6-inch tire.

For a pleasure car weighing 4000 pounds with 60 per cent of weight on rear axle and exerting 40 h.p. at the wheel rims with a speed of 35 miles, the vertical force at each wheel is 1200 and the horizontal 214. The resultant is about 400 per linear inch for a bearing width of 3 inches.

At curves with high speed cars, the horizontal force is considerably increased, for it is impossible to so "bank" a curve as to suit the speed of all classes of traffic.

In the case of wheels transmitting vertical loads only, observation indicates but little dust raising from a road not overlaid with loose dust. Such a wheel will at the point of mathematical tangency have no velocity relative to the road; a vertical velocity is imparted to it and as any section leaves the surface it will raise with it any of the lighter particles that are loose and may come into contact with it. At the driving wheel there is a slight slip which in addition to lifting will throw particles backwards.

These are the forces tearing at the road surface. In some cases they are more than the road can stand. The horse's calk acts somewhat like a chisel. It will pry out the binding material between the stones as well as the latter themselves when the bond is weakened. The driving wheels of motor vehicles push or suck any ma-



terial thus loosened out of place. The binder loses weight as it parts with moisture; besides this, without moisture it also loses, not only its property of recementing itself under pressure but to a great extent, its binding power as well. The real work of transmitting the stresses due to traffic must be borne by the stone. These are merely held in place by the binder. The latter is gouged out by the horse, drawn or pushed out by the automobile tire, blown away by the wind, or washed off by the rain and a loosening of the upper stone results.

Even on a well consolidated road climate stresses impose a heavy duty. If, however, there be voids the risk of failure increases. Voids may be due to deficient rolling or to the rise of too much clay in the earthy binder. Lumps of this material will bridge the spaces between stones even under hard rolling. The bridge will break down eventually either from pressure or moisture or a combination of them. A void forms where the bridge was and continues rising until near the surface when ravelling results. The same may be true in the cases of too light rolling.

When bituminous material is used as binder it is liable to disintegration from weathering, from overheating or from admixture of earthy materials.

An ordinary water bound macadam may lose material by wear up to a thickness of about a half an inch a year without being overloaded. The thickness that can thus be lost will vary with conditions, one of which probably is the ratio of the maximum wheel load to the total tonnage borne by the road.

Whatever the rate of waste it must be replaced if the road is to be maintained.

To summarize the foregoing, roads ravel from: (1) improper construction, (2) overload, (3) neglect. In all cases these affect the binder.

Poor workmanship in construction can only be cured by remedying the original defects. These generally show themselves by small local depressions in the surface from which ravelling spreads, in certain cases at an almost incredible speed. In bituminous surface faulty material and thin spots generally show up clearly. In both cases the only remedy is to rebuild the work properly, if necessary, from the sub-base up. This is not strictly repair work.

In considering the effect of overloading and neglect it must be borne in mind that any given type of construction may be so maintained as to vastly increase its carrying capacity. The problem is largely one of economics and administration. As an illustration, assume in two cases the same foundation—let one road have a water bound macadam surface dressed with a heavy bitumen forming a sheet about  $\frac{1}{2}$ -inch in thickness and the other a bituminous concrete (mixed method) surface of say 2 inches. The former will cost about 40 cents for stone and 15 cents for dressing, or 55 cents per square yard, and the latter about \$1 (both exclusive of the founda-

tions). With proper care the lighter surface will last about three years under fairly heavy traffic, the heavier one an unknown period, but let us assume twelve years. The total yearly charges against the two may then be stated about as follows:

<i>Dressed macadam</i>		<i>cents</i>
Interest on cost, 55 cents at 4 per cent .....		2.2
Depreciation, $\frac{1}{3}$ of 15 cents .....		5.0
Labor (patrol system) .....		1.9
Materials { Stone $\frac{1}{3}$ cubic foot at 9 cents .....		3.4
{ Bitumen $\frac{1}{3}$ gallon at 12 cents .....		1.5
Total .....		14.0

<i>Bituminous concrete</i>		<i>cents</i>
Interest on cost, \$1 at 4 per cent .....		4.0
Depreciation, 1.00/12 .....		8.3
Labor .....		0.9
Material .....		0.8
Total .....		14.0

The fixed charges are 7.2 cents against 12.3 cents.

The operating charges 6.8 cents against 1.7 cents.

I do not claim that these figures are more than illustrations of the principle involved. They show a great saving in operating charges, those that show up in the yearly tax bill. The fixed charges, however, are just as real and must be met at some date.

For a road with 9,500 sq. yards per mile the costs as shown in yearly tax charges, where depreciation and interest are not visible, would in this case be,

For the dressed macadam, per mile .....	\$636.50
For the bituminous concrete .....	161.50

yet as shown above the real cost of the two roads is the same. This case affects our subject because the treatment of a ravelled road surface must depend on the system of maintenance.

In most communities the great consideration is the next yearly tax bill. If that can be kept down for a period the ultimate economy of such a policy receives but slight attention. It is generally easier to get money for a new road than for repairs. A road requiring a large yearly repair charge is condemned without a hearing. The road calling for heavy interest and depreciation charges may be an equally or even more expensive solution; but the interest charge is not so apparent and the depreciation charge is not made. This is simply putting off the day of reckoning which is sure to come. However, the troubles of those in charge ten years hence are usually lightly borne by the officials of today.

If we consider the structure of the road surface we can easily see that the 40 per cent of voids in the macadam stone will be filled somewhat as follows:



Surface stone passing 1-inch ring and caught on $\frac{1}{2}$ -inch ring,	15 to 20 per cent
Screenings, passing $\frac{1}{2}$ -inch ring.....	15 to 10 per cent

When dry the clay is driven off to a greater or less extent as dust, washed away or splashed off as mud. Its place is supplied to some extent by detritus the result of the wear of the larger and heavier materials. These also blow or wash away and the road loses its bond. If our road is not overloaded we can retain its usefulness by making good its losses, with proper materials in their needed proportion. It is here that the trained road man is most needed. Nothing can replace his experienced judgment.

In the case of a ravelled road having first determined that the road was well built we must decide whether the traffic is too great for the type of surface, or whether the failure was due to neglect. If the former we must resurface with some better type. If the latter we can repair the old surface.

Resurfacing should always be preceded by scarifying and by bringing the road up to the necessary depth of stone. For water bound macadam needing greater surface strength several classes of chemical binder may be used of which I shall discuss two, bitumen and lignin.

The bitumen may be applied either by penetration or mixing methods. The former is the cheaper, the latter the more trustworthy. Which method is to be used will, after consideration of the care the road will receive, depend on the estimate of the overload, as will also the depth of the bituminous sheet. My own observation leads me to question the wisdom of attempting to get any thickness exceeding one half inch by penetration methods. It also leads me for this class of work to prefer tar to asphalt. The former material appears less sensitive to injury by dirt and to yield better results in repair work.

The lignin binders are derived from the waste products of wood pulp or tannin manufacture. They are cements being also used to bind core sand in foundry work and impart a tensile strength to the binding materials. They will not act on materials soaked in the so called road oils. The action of some of these materials on slag and red shale is quite remarkable. They are slightly soluble in water and will therefore need renewal. Their application, however, is easy and inexpensive and the effect of successive applications seems cumulative, increasing not only the depth of penetration but the strength of the bond. The water proofing of lignin bound roads with bituminous tops has been carried out in Connecticut but I am unable to give any facts as to the results.

For water bound macadam roads that have failed through neglect a thin coat of gravel carrying some earthy matter or of screenings or coarse sand mixed with earth will usually cure cases that have not gone too far. In some of the counties of New Jersey it is usual to fill all ruts, depressions, etc., with fine stone and to give the middle of

the road a coat of the same mixed with a little clay. Much of this material is wasted by being thrown off the road by the traffic, and old ruts almost invariably reappear. This method, however, is very successful in preventing ravelling. It seems a false economy to omit rolling and wet rolling, at that. The same is true of patching holes with anything but macadam size stone. The roads treated with small stone are yearly losing depth. The moisture for wet rolling is usually bountifully supplied by nature in the early spring. It can also be had by the use of hygroscopic salts where water is hard to get. Traffic will usually throw off from the road surface enough stone to pay for rolling.

A treatment of clay, without rolling, will often give astonishing results. Such treatment, however, seems only a palliative not a cure. Roads thus treated become dusty or muddy according to the weather, show a tendency to ravel again and are hard to properly treat with bitumens. They will, however, take the lignin binders with good results, if the dose of clay has not been excessive, or if the excess is swept off before treatment.

In closing a word of warning as to the use of the so called cold oils may not be out of place. Those of the so called non-asphaltic class, to a greater extent than the so called light asphaltic oils, seem to act as lubricant on road materials and to foster pot holes, ravelling, and other failures. It may be possible to properly apply these materials but if so it is rarely done. It is certain that even slight depressions will cause a deep penetration of the road. The dust laying qualities of the material thus absorbed are lost and its lubricating effect given the best possible conditions to get in its pernicious work. Local authorities and even private individuals seem to select roads with uneven surfaces as those on which to use these oils.

MR. ROBERT C. TERRELL: In discussing this excellent paper and this very important subject, I wish to say that Colonel Stevens' paper shows that he has given this most vexing problem a good deal of time and thought and his explanation of the causes of the ravelling of the macadam road is beyond question. However, I disagree with him, in so far as he advocates the use of earthy materials as a binder, since earthy materials not only render the surface susceptible to retaining water but also permits the percolating of water into the subgrade.

The discussion in this paper showing the effect of motor trucks and motor driven vehicles, shows conclusively that an excess of screening or the use of earthy materials for a builder are objectionable. The tendency of water bound macadam roads to ravel under heavy motor traffic, may be largely overcome by increasing the size of the stone in the top course and using only a sufficient amount of screening and stone dust to cement the whole together after being thoroughly wet and rolled. The larger stone should be plainly visible on the surface and the surface should have the appearance of a conglomerate rock that has been cut with a saw.



Colonel Stevens says, "Whatever the rate that wastes, it must be replaced if the road is to be maintained." This is very true, however, if the road be worn uniformly, it will not be economical to try to replace the amount worn off, by fine stone but sufficient time should elapse to justify the placing of a course of stone sufficient to bear the traffic and not be blown away by rapidly moving vehicles. But uniform wear is rarely the case. Where ruts and large holes occur they should be promptly filled, not with small stone but stone of the same size and character as that in the surrounding course and well tamped.

The discussion of the bituminous surfaces is carefully worked out and I shall not attempt to go into detail on the discussion of figures for bituminous macadam and bituminous concrete. It is very evident that the following statement from Colonel Stevens' paper is the correct status of affairs throughout the country, "In most instances the great consideration is the next yearly tax bill. If that can be kept down for a period, the ultimate economy of such a policy receives but slight attention. It is generally easier to get money for new roads than for repair." In order to properly maintain a road must of necessity have been properly constructed and since it is generally conceded that water bound macadam road is not satisfactory under heavy motor traffic and it is necessary to employ some sort of bituminous treatment. The heavy asphaltic oils have been used very successfully on the water bound macadam roads of Kentucky, and have given excellent results. However, the road to receive this oil should have been built at least six months in advance of its first treatment, in order to give the stone time to season or rid itself of the quarry sap. All the excess dust and foreign material should be carefully swept from the surface of the road and the oil applied evenly over the entire macadam surface. Traffic should be suspended until the oil has had time to penetrate. This can be accomplished by oiling one side at a time, thus permitting the use of the other side of the road. If the oil is not applied evenly, the surface will generally ravel or form pot holes where the surface fails to receive the treatment. The road should receive one treatment of the oil each year, in the early spring. If, however the same macadam on which oils or bituminous concrete are used, (a surface free from ruts or depressions) a treatment of Kentucky rock asphalt should be placed 2 inches in thickness and properly rolled. The maintenance charges will at once become a minimum. This Kentucky rock asphalt may be applied cold after having been prepared by grinding. It is not only efficient but easy to place and requires but little attention after it has been thoroughly consolidated. I believe that this material can be economically used for surfacing and for maintenance purposes anywhere within a radius of 1000 miles of the Kentucky field. The material of which I speak is a sand stone pregated with about ten to twelve per cent of asphalt and is found in Edmonson County, Kentucky, there being about 80,000 acres of this deposit ranging

in thickness from 12 to 50 feet. In 1906, or about that time the United States government constructed approximately a half mile of road of this material, near Bowling Green, which is now in an excellent state of preservation and shows little or no bad results from its constant and heavy use. It is safe to say that this material would not cost more than 50 cents per square yard in place anywhere within a radius of 500 miles. I believe that that price can materially be reduced when the field is more fully developed.

This material can be used with same results at a thickness of 1-inch after consolidation, which would double the number of square yards per ton of material but of course cut down the life of the road.

Under the advance system of road construction and the heavy motor traffic, I do not believe it economy to recommend or to permit the building of stone roads without the use of the roller, and while Colonel Stevens says "A treatment of clay without rolling will give astonishing results." I agree with him and also his latter statement in which he states, "Roads thus treated become dusty or muddy according to the weather." I believe such treatment of our roads should be discouraged as far as possible.

MR. UNDERWOOD: I want to say to you gentlemen of the Convention that we have no business to let a gravel road wear out; it is absolute foolishness. What in the name of common sense is the use of building a thing and then sitting down and letting it wear out? It is absolute nonsense. In the city of Battle Creek, where I am commissioner of public works, we have some gravel streets. In the surrounding country outside of Battle Creek, we have some gravel roads. Let me tell you the difference between the way in which these gravel roads are kept up. In the city of Battle Creek, we don't drag our streets, it doesn't amount to a row of pins to put a drag onto a hard graveled street that has got holes in it; what you want in the holes is some more gravel, and that is what we put into the holes in the graveled streets of Battle Creek. Every year we go over our streets and fill every hole with gravel. When that hole has got water in it, we know where the hole is then and plug it up and it stays plugged up for a year and possibly for more than a year. Now, the way they do out in the country surrounding Battle Creek, they let their roads go until they are so full of holes that when it rains they are simply a continuous streak of ponds of water, and then they undertake to fill those holes by dragging the roads, and that is absolutely fooling away your money. I want to tell you gentlemen of this Congress that if you want to keep up a gravel road, you have got to fill the holes. Its the same way if I want to keep up my coat and a hole gets in it, I have got to patch the hole.

MR. SMITH (of New Jersey): We run the steam roller and the disc harrow over them and then they are in good condition to spread again.



THE CHAIRMAN: Mr. John S. Gillespie will now deliver an address on "Development and Maintenance of Highways in Allegheny County, Pennsylvania."

## DEVELOPMENT AND MAINTENANCE OF HIGHWAYS IN ALLEGHENY COUNTY, PENNSYLVANIA

BY JOHN S. GILLESPIE

*Road Commissioner*

Allegheny County, Pennsylvania, was created by an act of the State legislature on September 24, 1788, being formed from parts of Westmoreland and Washington Counties. In 1789 an additional part of Washington County was annexed. It then comprised all the land north and west of the Ohio and Allegheny Rivers, but was subsequently reduced by the creation of Armstrong, Beaver, Crawford, Erie, Mercer, Venango and Warren, and parts of Indiana and Clarion Counties. Its area is approximately 755 square miles. Its population in 1860 was 178,831, the 1910 census showed a population of 1,018,000.

Allegheny County derived its name from a tribe of Indians called the "Allaghans," who formerly lived along the Allegheny River.

The surface is undulating and near the large streams hilly. The lands are fertile and make excellent farms. The great wealth of the county lies in its immense mineral resources. Bituminous coal of the finest quality abounds, varying in thickness from  $5\frac{1}{2}$  to  $8\frac{1}{2}$  feet.

The Allegheny and Monongahela Rivers join at Pittsburgh, forming the Ohio River.

Allegheny County is so situated that all its main roads lead to Pittsburgh which is in the center. These main roads lead to the outer borders of the county, connecting up with Butler, New Castle, Washington, Freeport, etc., with many cross connections. In fact its features resemble a wheel, Pittsburgh being the hub.

The question of good roads evidently was given careful consideration in years gone by, as in going over the court records we secure data pertaining to the old turnpikes and toll roads. These in the majority of instances were planked roads, having a plank roadway 8 feet in width with an earthen or summer road alongside; and, I might state that even today there are several miles of such roads in our county. There are, however, no toll roads in the county, the same having been condemned and purchased by the county, and then dedicated to the public as free roads.

Sentiment for good roads continued to grow, for in the early part of 1895, the governor of Pennsylvania approved what is known as the "Flinn road act." This act provided for the laying out, straightening, widening, altering and otherwise improving of the then existing highways. It provided for the issuing of road bonds or a direct tax, in payment of such improvements; also, it provided for the levy of a road tax by the county for maintenance, sinking fund charges, etc.

It was under this act that the road department of Allegheny County was created, and the department has been an important feature of the county commissioners' ever since. This act was effective until May 11, 1911, when a new act was approved. This new act provides for the improvement of routes through cities and boroughs thereby connecting up with the road system in general as laid out by the county commissioners. This new act also increased the bonding power of the county for road improvement, allowing the issuance of 2 per cent of the assessed valuation, without being compelled to submit the matter to the voters for a referendum vote. Under this act the county commissioners are permitted to issue bonds to the amount of \$22,000,000.

The present commissioners of Allegheny County are Irvin K. Campbell, J. Denny O'Neil and Stephen J. Toole, the present term being their second term in office. This board has always been active in road improvement, they have given the matters of construction and maintenance their earnest consideration, and the present excellent system of county roads is the result of their earnest efforts.

The road department commenced building roads in August, 1897, and the work has been continued ever since. We feel we have accomplished a little in the way of road improvement but we have lots to learn as this is a big proposition. It is important and cannot be solved in a day or a year. There are many conditions to consider, what may be a good road for one section will not answer in another. We first started by building macadam roads, having a telford foundation 8 inches in depth with a macadam wearing surface 4 inches thick. Our roads are all graded 30 feet wide and in the majority of cases the improved portion is constructed 16 feet in width, in a few cases we only improve 14 feet.

Up to the end of 1905 we had 153.7 miles of macadam road, today we have 437 miles of improved roads of various kinds, completed and under construction. Aside from this there are 22 miles of plank roads. The two remaining planked roads, however, have been taken over by the highway department of Pennsylvania, being a part of the famous Sproul system. Portions of these plank roads have been improved with brick and asphalt-macadam construction and it will be but a short time until they are a thing of the past, the remaining portions, it is hoped, will be replaced with a permanent road in a short time.

Under the acts already mentioned the County of Allegheny, up to the end of 1912, issued \$10,250,000 in road bonds. A road tax, varying from  $\frac{1}{10}$  of a mill (this being the tax levy in 1902) to  $\frac{1}{4}$  of a mill (the present tax levy), has yielded \$4,449,040.90, this having been applied to maintenance and sinking fund charges. The sinking fund charges from 1902 to 1912 amounted to \$3,904,791.10, leaving \$10,794,249.80 as a net amount for road purposes.

At the time we commenced building macadam roads, they were considered the "ideal roads." Conditions alter cases, however, and



with the advent of the automobile, the heavy truck, and continued use of narrow tires, it was readily seen that a more substantial road would have to be considered. Narrow tires play an important part in the ruination of a macadam road. Our roads, we think, are constructed right, the best of material obtainable is used for the surface and still the macadam road cuts into ruts. Our board of commissioners at once realized that a more durable road would have to be adopted, so in 1909, after a careful investigation of roads in and through the eastern States, they awarded contracts for the first asphaltic-concrete surfaces in Allegheny County. The ease with which this surface is laid, the slight inconvenience afforded the travelling public, and the fact that it is a dustless road, convinced the commissioners and the public in general that it was a step in the right direction, towards solving the road question. Since constructing the first asphaltic-concrete roads, our commissioners have received numerous requests for this class of pavement. I might state right here that the roads first treated with this asphaltic-concrete surface were those that were subjected to the heaviest kind of travel. They are main routes to Freeport, Pa., and to Steubenville, Ohio, and are subjected to all kinds of automobile travel, hauling of heavy builders' supplies, etc. Neither of the roads constructed during 1910 have as yet required one penny of cost for maintenance, and present conditions seem to be improving with age.

The asphaltic-concrete road while costing more than the old style macadam is cheaper in the end when one considers the matter of maintenance. We feel that we will not be required to do anything in the way of repairs for eight to ten years, while with the macadam road our conditions require resurfacing, or top dressing, every two or three years at most. The macadam road, you all know, is a disagreeable road in wet weather. Mud from the side roads is dragged on, and remains there until dried out by the sun. While mud is also dragged on to the bituminous road, the first rain washes the surface clean. With the hot mixed material no delay is suffered by passing vehicles, the road is at all times open to travel, while the macadam road suffers more or less during the time of resurfacing, until the same has thoroughly bonded. This makes an ideal road through villages and in residential sections. This bitulithic pavement is made of crushed stone, sand and asphalt. The stone is mixed in predetermined proportions as regards sizes, to provide a maximum density and minimum of voids, so that when rolled in place it is nearly as dense as a block of solid stone. The surface offers as little resistance to traction as asphalt; it is not slippery. The small stone used provides a gritty surface somewhat similar to macadam and affords a secure footing for horses at all times. The application of the seal coat makes the road practically water-proof. It easily supports the passage of high speed vehicles, and heavy travel, without loosening the bituminous filler and therefore does not affect the stone, and no dust comes from the pavement or its material.

In using the term "asphaltic concrete" I wish to make it clear that I do not refer to the form of construction which has been exploited during the past two or three years and misnamed "asphaltic concrete," being merely a sheet asphalt or mortar pavement (less the essential binder course) with a very little (the specifications say "less than 10 per cent" which may be none) crusher screenings coarser than  $\frac{1}{4}$ -inch size. The presence of this small percentage of fine crushed stone surrounded or "floating" in mortar in my opinion makes the construction weaker than a pure "asphaltic mortar" without the screenings for the reason that the tendency of traffic is to dislodge any of the other detached particles of stone which may be near the surface.

The asphaltic concrete of Allegheny County measures well up to the clear concise definition adopted by the American Society of Municipal Improvements for *true asphaltic concrete*, as follows:

Bituminous concrete is a pavement consisting of a combination of broken stone and sand, or fine mineral matter, cemented together with a bituminous cement, and which has all its ingredients mechanically mixed before being laid. To be termed a bituminous concrete it must partake of the well known characteristics of concrete, that is, there must be stone enough in its composition to form an important part thereof and add to its strength and durability; also, there must be enough of the mortar constituent, that is, the sand and bituminous cement, to properly support and bond together the largest particles.

This differentiation between the true, real and the spurious misnamed "asphaltic concrete" is most important.

The maintenance of the macadam road is expensive in our county. We do not have any local stone that will answer, it is all shipped in by rail. In the majority of cases we have hauls of 4 to 6, and in some cases 8 and 9 miles from the railroad to the road. This material must be handled a couple of times and you can readily appreciate why our macadam roads cost so much.

While we have paid considerable attention to the asphaltic concrete road, asphalt penetration work also was carried on. Various grades of asphalt were used for this work, and the roads laid to date all seem to be in excellent condition. Close on to 45 miles of this class of road has been laid. This pavement has been laid on roads that are not subjected to as heavy travel as the ones on which we place asphaltic concrete.

The brick road has not been overlooked, either. Approximately 42 miles of brick roads have been laid. Probably half this mileage has been laid with the old macadam road as a base. This work is done by the maintenance branch of the road department. Brick construction costs \$22,000 to \$25,000 per mile, and covers 13 feet 6 inches of brick pavement, two concrete curbs (flush and combination curb and gutter types), with concrete base 5 inches in depth. It also covers grading, drainage, etc. As a matter of general information to those who have not gone over any of our roads and will probably question the reason of our high costs, would say that our grading



averages 11,000 to 12,500 cubic yards per mile of road. Many streams are encountered, and the construction of culverts and bridges further add to the cost. As herein stated, a large part of our brick work has been done by our maintenance branch using the old macadam road as the base. The surface is scarified and formed to a true cross section, concrete curbs built, sand cushion planed and the brick laid. The surface is then grouted with a cement and sand mixture of equal parts. We find that the increased life of the road laid on this old macadam base, gives us a road much cheaper than with the concrete base and we get a solid foundation. One of the bad features in connection with this class of pavement is the grinding off of the brick at the expansion joints alongside the curb, and the breaking off and grinding up of the concrete curb.

A large percentage of the asphaltic concrete roads in Allegheny County have been laid over the old macadam utilized as a foundation after levelling up and scarifying where the contour or depressions are such as to require such regulation of grade. It is my belief based on our practical experience of four years' use in Allegheny County that this is the most economical and successful method of conserving the macadam on country thoroughfares on which the automobile traffic has become so great as to make it impracticable and uneconomical to longer maintain the macadam as a wearing surface.

The macadam road has not been entirely eliminated in Allegheny County. Where traffic is light and particularly in the outlying sections, this class of surface is still laid. In this year's reconstruction work by our maintenance department, we are laying about 8 or 9 miles of water bond macadam. In order to prolong the life of our macadam roads, we have done considerable in the way of experimenting with light and heavy bodied asphalt oils, using screenings and torpedo gravel in connection therewith. The light oils are mostly used for dust laying purposes. This is an important part of our season's work, the passing automobiles and even the slower vehicles raise immense clouds of dust, and we are compelled to keep a force of eight tank wagons busy applying oil, to relieve the people that reside along the macadam roads. We are just about completing our 1913 oiling, and to date we have used over 250,000 gallons of oil.

Now, as you can see we have been endeavoring to find the ideal road; our roads cost a lot of money. We endeavor at all times to build them right and to keep them in the very best shape possible. In passing from the waterbond macadam road to the asphaltic concrete road, we feel we have taken a step in the right direction. Our experiments have demonstrated that it is the ideal road. It is necessary however, that the material be mixed with good asphalt. There are many many kinds of asphalt on the market today, and to take and use the cheap grades, we feel it is a mistake. On the Freeport Road which was the first road we reconstructed with this kind of surface in 1910, this spring a huge slip occurred carrying part of our road away with it. Repairs were necessary to this portion, and from the part

that slipped away, we had samples cut out (I have a sample or two with me, the same showing its vertical cross section and if any desire to examine the same will be glad to show them). This sample does not show any wear whatever. The asphalt used in its mixture was the best that could be obtained, and in the sample taken up the asphalt still retained plenty of life. The chief chemist of the New Jersey highway department happened to be in Pittsburgh at the time I received the sample, and he expressed great surprise at the condition of the asphalt, considering length of time in use, etc.

Last, but not least, in the matter of highway improvement, Allegheny County was not only among the first in the matter of road improvement, but at the same time we inaugurated a "patrol system." This system has been in service since the completion of our first roads, and is added to as occasion demands. Today we have 128 caretakers on our various roads. We endeavor to place a man on each road, that is, we give each of our caretakers 4 to 5 miles of road to care for. It is the duty of these men to keep the roads in good shape at all times, that is, insofar as minor repairs are concerned. They are required to look after the drains, the earthen road alongside the improved portion must be kept free from grass and weeds, all loose stones must be removed from the road, and they must look after the removal of all small slips or slides. Also, the matter of obstructions, such as telephone and telegraph poles, sewer heads, bridge walls and copings, etc., the same must be whitened or whitewashed. These act as a guide to the traveling public and are very much appreciated. They also are required to keep the department advised of any and all accidents that might occur, making detailed report of the same.

In conclusion, while we have accomplished something in the way of road building, we feel that we have just commenced. Each day presents something new. The records furnished you deal entirely with the County of Allegheny. We have several miles of road improved by the highway department of Pennsylvania. No aid was extended to the county in its system of roads, but in order to get additional mileage of improved roads, the county has, in numerous cases, joined with the State in improving of State roads within the limits of the county, paying one-eighth and in some cases one-fourth of the total cost.

While our county occupies a foremost place in the movement for "better roads," it possibly might be interesting to some to know how this proposition is financed. As before stated, road improvements in our county are carried on by the issue of bonds. The assessed valuation of our county is greater than that of the States of Maine, New Hampshire and Vermont combined, totalling \$1,175,000,000. By issuing road bonds, and thereby allowing future generations to share in the cost, we are able to operate with a low road tax.

**THE CHAIRMAN:** The chair will have to make a general apology to everyone who talks here, but in order to give everyone a chance,



we have got to limit ourselves rather closely. The next subject we have got to discuss is "Bituminous Macadam, Construction and Maintenance," by Mr. S. D. Foster, chief engineer of the State highway department of Pennsylvania.

## BITUMINOUS CONSTRUCTION

BY S. D. FOSTER

*Chief Engineer Pennsylvania State Highway Commission*

The subject of bituminous construction, the one upon which I have been invited to speak, is such a broad one, and one upon which so much has been said and written, that I will not attempt to discuss its merits, compare it with other types of pavements, or take up the correct method of maintenance after construction, but will deal entirely with the two types of construction most commonly used by engineers today, viz: The bituminous road constructed by penetration method, and the bituminous road constructed by mixing method.

Speaking generally of the two methods of construction, and taking into account the hundreds of miles of bituminous roads already constructed, I feel safe in saying that there is probably no other type of construction about which there is less absolute information concerning the physical and chemical characteristics of the bituminous materials and the road metals which will bring about the best results. There is no type of road construction which requires more care or more consistent expert supervision and inspection than that involved in the use of bituminous material, and, until such time as we are able to thoroughly educate and instruct efficient and capable engineers and inspectors in this type of construction, the same will remain in an experimental stage. In general, also, I would state that the preparation of the sub-grade, the drainage, and the foundation are extremely important in the success of bituminous pavements, and, unless properly constructed, will bring about their destruction. I might state at this time that, to my mind, the experimental stage in foundation work has been passed, and, that for the ordinary country traffic to which the average highways must be subjected, an 8-inch telford foundation, or a 5-inch cement concrete foundation, when properly constructed, is sufficient for the carrying of any class of pavement which we may desire to place thereon.

Presuming that the foundation has been properly completed, I do not believe that I can better describe the method of building thereon a bituminous penetration pavement than by quoting from the Pennsylvania State highway department's specifications, to wit:

Upon a suitable foundation there shall be spread a layer of broken stone of such quality as may be suitable. The stone shall be broken in fairly uniform and regular cubes, free from dirt or dust, and comparatively free from flakes or splinters. The stone shall be of such size that they will pass a 1½-inch cir-

cular opening and over a  $\frac{1}{4}$ -inch circular opening. This layer of stone shall be of such thickness that, when it has been rolled with at least a 10-ton power macadam roller, it shall have a thickness of 3 inches.

The surface must be firm and, when completed, correspond to the grade in proper crown of cross-section. Upon each square yard of this surface shall be evenly spread, by means of an approved pressure distributor or fan-spout sprinkling-pot, from  $1\frac{1}{2}$  to  $1\frac{3}{4}$  gallons of bituminous material, of a penetration from 90 to 120.

The bituminous material shall be heated to a temperature of approximately 350°F. Immediately thereafter, sufficient dry, dustless screenings, passing a  $\frac{1}{2}$ -inch screen, shall be spread in sufficient quantities to evenly cover the entire surface of the road and take up excess bituminous material. The road shall then be rolled until firm and a smooth surface results and conforms to the longitudinal and transverse section.

While the surface is clean and warm, a seal coat of bituminous material of proper consistency to be flexible when cold, shall be spread  $\frac{1}{2}$  gallon to the square yard. It shall be applied while at a temperature of 350°F., and, while the bituminous material is in a liquid state, there must be spread a top dressing of clean, dry, Torpedo sand, or dustless stone chips, in sufficient quantities to cover the entire surface of the road and take up any excess bituminous material.

Immediately thereafter, the road shall again be thoroughly rolled; if so directed, the stone, stone chips, and sand must be heated. In rolling, the roller should start from the side line and work toward the center, and, in all cases, continue until thorough compression is secured.

By following these instructions, a first-class penetration pavement can be constructed, but, in the experience of the department, the engineer has continually occurring the several conditions which I am about to enumerate, any one of which, escaping his attention, will be bound to produce a weak spot in the pavement, to wit: The presence of water in the foundation, due either to wet weather springs, or to rain-fall after the foundation has been placed. This condition results in water working up through the telford stone; thence through the stone comprising the aggregate of the pavement; and attacks the bituminous material, which losing its bonding powers, readily disintegrates the pavement. Another condition oftentimes occurring, is due to the contractor not napping his telford properly and attempting to bring the same to the proper crown and cross-section by the use of stone spalls. These cannot be thoroughly rolled into the foundation, and, when the stone which is to be treated with bituminous material is hauled on the road, the spalls continually work up through the smaller stone and produce a weak place in the finished pavement.

The use of soft stone, especially in districts where local stone is used for road purposes, furnishes another problem for the engineer. Soft stone, when placed in the pavement and rolled, may seemingly be treated with bituminous material and thus cover up all cracks or fractures which may have been made by the initial rolling, but the rolling of the pavement, both after the first application of the bituminous material and by the final compacting of the same, will again fracture more or less of the stone aggregate. These fractures, occurring as they do after the application of the bituminous material,



will be void of binding qualities and the stone will immediately start to break down through continued rubbing, one piece against the other. This, in itself, produces dust and allows the moisture to penetrate into the pavement, again causing destruction to the bonding powers of the bituminous material. In addition, this soft stone is readily worn away by passing vehicles and serves to shorten the life of a bituminous pavement.

Stone crushed in quarries, where there is an abundance of stripping, or where there is a strata of soft stone, or stone hauled upon the highway and allowed to stand for several days subject to clouds of dust from passing vehicles, become covered with a fine film of dust particles. Stone of this character, when placed in the road and subjected to the application of bituminous material, cannot be properly bonded, inasmuch as the bituminous material, while covering each stone, is unable to directly bond itself to the stone proper, for the dust layer covering the stone will act as a barrier and, while the bituminous material will or may hold the stone in place in the pavement, it will not have the proper bonding of one particle of stone with another. Stone with a smooth non-porous surface will prove a failure on account of the inability of the bituminous material to adhere thereto. Wet or damp stones result, likewise, in the bituminous material not obtaining any adhesion. It is well also to avoid those classes of stone which do not crush in a cube or near-cubical shape. Stone that break or crush in splinters will not take the compression and will not interlock themselves one with the other in the manner most desired in accomplishing first-class results.

The selection of a suitable binder is a most important matter, requiring skill and judgment. There is no one "best" product, and the selection must be governed by a number of conditions. The principal features to be considered in this connection are: The characteristics of the stone to be used; the manner of applying the bituminous cement—whether the material is to be applied hot or cold, by means of distributors with or without pressure, or by pouring-pots;—the quantity and character of traffic to which the road will be subjected; climatic conditions; the cost of bituminous material; and the probable cost of application.

Inasmuch as the results to be obtained are the securing of a compact, uniformly solid paving surface, impervious to water, it is obvious that continued and experienced supervision and exceptional care be taken. Equally important with the selection of the bituminous material is the care with which it must be heated, as the slightest over-heating will burn the product and render it unfit as a binder. It has been my experience that no successful results can be accomplished unless the inspector keeps continually with him on the work a thermometer, with which to test the temperature to which the bituminous cement is being subjected. Another frequent failure occurs through lack of uniformity in the quantity of bituminous material applied to the stone and is caused by crude or careless ap-

plications, and cannot bring about proper results. The hand-pouring should be supplanted by suitable mechanical distributors which will apply the bituminous cements under pressure and insure thorough penetration and a more even application.

In enumerating the various mistakes which so often occur in penetration work, I would say that the cause of failures can be readily traced in many instances to faulty plans and specifications, lack of care and judgment in the selection of materials, poor and inadequate equipment with which to carry on the work, inexperienced labor for both skilled and unskilled service, continuation of work during unseasonable or inclement weather, and insufficient funds to expedite the work under way. I might say in passing that probably the most noticeable cause of failure is that a class of incompetent contractors, having absolutely no experience in bituminous construction, bid on highway work and look to the engineering department as a school of instruction for their guidance.

As to what the life of a bituminous penetration pavement will be, time alone can tell as the body of these roads contains a mass of material that is not evenly, properly, or finely graded. There exists sections that are both coarse and fine, permitting an application of the bituminous binder either in excess or deficiency; and, possibly, in some instances, only a light seal application is secured. While this condition does not exist generally, I must acknowledge that it is there and feel that wherever this method of construction has been, or is being, followed, it is only a question of time until the weak places show signs of disintegration; these, of course, can be repaired by an efficient maintenance force, and upon this maintenance force the probable length of life of this type of pavement depends. Where this class of pavement is supervised under the most expert management, the results at best are only those of a surface character and produce a road that for the time being seems to give satisfactory results.

Bituminous concrete pavements, constructed by the mixing together of stone, sand, and bituminous cement, in mechanical mixers, reduce the chance of failure to the minimum and eliminate many of the causes of failure found in penetration construction.

It is not necessary for me to discuss here the material, its size, quality, or character, or to explain in detail how this mixture is secured, as the average engineer is well acquainted with this type of pavement, inasmuch as it is very similar to the mixtures used in all the large cities for street purposes. While the best results from this type of pavement are obtained by using a cement concrete foundation, it is not absolutely necessary that such a foundation be used, as experience has demonstrated that water-bound macadam roads, where they have been properly drained, can be resurfaced with a mechanical mixture, and the results therefrom compare favorably with those of sheet asphalt streets. This type of construction has been a success and I feel safe in saying that most of the old water-



bound macadam roads that have been torn by the heavy traffic can readily be brought to grade, properly crowned, made firm, and covered with a bituminous concrete that will be economical and serviceable for many years.

I do not very much believe in the use of telford foundation for a mechanically-mixed surface, as it is almost impossible to obtain, upon a telford foundation, a surface that will not be more or less wavy, and we all know that bituminously-constructed pavements, which have a wavy surface, are soon doomed to destruction. In the construction of this type of pavement, there are a few points which must be closely watched: The first—and to my mind the greatest—is the resultant mixture produced by the majority of mixers at present in use. There is a tendency in all revolving mixers to bring the large stone together, and, unless in the dumping of the mixer this is closely watched, the purpose of mixing will be defeated, which is that of having the aggregate of different sizes so mixed as to give the lowest percentage of voids. This condition will again arise if the material has to be transported a very great distance from the mixer to the road, as there will be a tendency for the larger stone to work toward the top of the load and the smaller material toward the bottom. So, it is important, in placing the material in the pavement, that it should first be dumped upon a platform, and from there shoveled into place in as uniform a mixture as possible.

I have used two different distinct types of mixed bituminous construction: One, a cut-back bituminous material which remained in a plastic state for several days after being placed on the road, thereby bringing about a continuous bonding process, by means of local traffic passing over the road. The result of this was to bring about a perfectly smooth and uniform surface, in which there was probably from 70 to 80 per cent of mineral aggregate exposed, which furnished traction for horses' shoes and automobile tires, thus eliminating one of the great criticisms of this type of pavement. The other, a straight bituminous material of approximately 60 to 70 penetration, upon which a seal coat was used to bring about a smooth and compact surface.

Care should be exercised in determining the sizes of stone for the type of pavement which is to be constructed. From experience, I do not believe it wise to use any stone larger than will pass through a 1-inch ring, in the construction of a pavement upon cement concrete foundation, inasmuch as, in this type of pavement, while the load is seemingly carried upon the surface, it is in reality carried directly upon the foundation, and, if stone larger than 1 inch in size is used, there will be a likelihood of the larger stone occurring directly upon one another, thus throwing open the chance of fracture to either or both stones by impact from horses' shoes, or weight from the tires of heavily-loaded wagons.

Another point that does not favor the larger stone lies in the fact that sooner or later the stone is exposed in the surface in its largest

diameter, again placing it in a position to be fractured by traffic. When such fracture occurs, unless the pavement is treated from time to time with light applications of bituminous cement, it opens the way for moisture to enter the pavement and thus destroy the binding quality of the bituminous material.

Where ordinary care has been taken in the construction of mixed bituminous pavements which have come under my observation, the results obtained fully warrant a continuation of this kind of construction, and I believe that the time is not far distant when the experimental stages of these pavements will be a feature of the past, providing explicit specifications are drawn to plainly designate the quality of all bituminous and other material desired in each individual job, and the old practice of copying specifications and methods in use elsewhere, regardless of local conditions such as drainage, sub-base, and traffic, is discontinued; and providing we are successful in properly educating highway engineers, inspectors, contractors, and the forces, both skilled and otherwise, in connection with the use of all materials that enter into the construction of this class of paving; and I consider that in the very near future there will be little distinction between the general specifications that designate the construction of highway pavements and those that designate the construction of city streets, inasmuch as the automobile and automobile truck—which are the most dangerous factors in the destruction of the average pavement—will traverse the city street and the country road in equal numbers.

THE CHAIRMAN: The discussion on this paper was to be opened by Mr. W. A. McLean, provincial engineer of Ontario, Canada. Is Mr. McLean here? If not, the subject is open for discussion from the floor.

MR. GASH (of Illinois): I like the paper very well in some respects, but the thing that I am here at this Congress for is to learn not what the failures are but what we must do to make the successes. I like to hear the discussion of the successes of men like Washington, Jefferson and the great individuals of the world that have made successes, not those that have made mistakes, and if the last speaker would have told us what to do to keep away from those failures and the things to use to make the roads a success, I believe it would be better for us, and I would like to hear, in the future, the gentleman himself tell us what materials or some of the other gentlemen here tell us what materials should be used to get away from those failures.

MR. FOSTER: I might say that in taking up the failures we can, by the elimination of those failures, bring about the success of either of the pavements discussed. We feel in Pennsylvania today that we have eliminated the mistakes and our specifications have been so arranged as to bring about results and I am only giving you the



mistakes to throw your inspectors and engineers a little bit more on the track of what they should look out for in the elimination of certain materials to bring about a permanent result. The paper, when fully read, will explain all that.

A MEMBER: I would like to ask what the experience is in regard to the penetration method? I come from El Paso County, which built about 55 miles of bituminous pavement on country road by the penetration method and we are thinking of going to the mixing method. I would like to have the results of your experience.

MR. FOSTER: That is all answered in my paper. I dealt with both methods. In the penetration method, your road is open to mistakes and there is more chance of failure. In a penetration road you have, at best, nothing but a surface treatment; it will probably give you satisfactory wear four or five years. With the mixed pavement which we call fool proof, because, except in rare instances, you cannot depend on the type of men you get to give it absolute attention and you are not dependent on the mixers; when the sand and the asphalt has passed through, that mixture is thoroughly coated and you have very much less chance of making the failures. In the penetration method you have to take into consideration the climatic conditions, the method of applying your bitumen, whether it is to be applied hot or cold, by force sprinkler or hand spout and a thousand and one things. We don't think that the results we have in Pennsylvania would be applicable in each State. My idea is that each engineer should study the conditions he is confronted with and make separate specifications covering each individual road, but in a mixed road, on a concrete foundation, you have less chance of failure, and while the cost is somewhat greater I think the life of that pavement will fully repay you for it.

MR. CURRIE (of Ottawa): I am very much pleased to hear Mr. Gillespie's interesting paper that he read a few minutes ago, saying that he adhered to a Telford base on his roads. My opinion and the experience I have had, I think a Telford base is much preferable to the ordinary macadam base that you get usually from the crusher. In nine cases out of ten, in a macadam base, large stones, say 3 or 4 inches—you get very large quantities of flat stone which, by some extraordinary process, works through the ordinary macadam and works to the surface of your road, and after a considerable quantity of traffic has been over that road a rut is formed. This gentleman in front of me here asked for some of the successes of mixed or penetration processes on bituminous macadam roads. Up to a few months ago I was engineer for a little city called West Lawrence, close to Montreal, and had considerable success with the mixed method of applying tar, principally, and quite the reverse with the penetration method. The penetration process I found took

something like 3 gallons of tar per square yard, whereas, the mixed method took something slightly under 2 gallons per square yard. The penetration process, after traffic had been over it, the tar started to buckle up on the surface and in the hot weather became a menace and a nuisance both to pedestrians and vehicular traffic. We had quite the contrary experience with the mixed method; taking our stone, first of all heating it, freeing it from all dirt and moisture and afterwards applying hot tar and also mixing it in the mixer. That formed a glaze, really, over the Telford base. Over that we put smaller stone and treated it in a similar manner. After finishing, we painted over the surface with this particular tar we used; on top of that we put small screenings, screenings that perhaps would pass through a  $\frac{1}{4}$ -inch mesh, and I must say that we had considerable success with that class of construction. Another class of construction with which we also had considerable success was taking the ordinary water bound macadam road construction, which I need not enlarge on. After the road has been under traffic say two or three weeks, we apply one coat of tar paint on top and after that dried in we put another on and then screenings on top, and we had considerable success with it.

A MEMBER: I came here to learn and have learned a great deal. I am somewhat enthused now regarding Congress passing laws in order that we can have thoroughfares from one end of the country to the other. I have heard discussions here on different roads. I represent Macklin County as county commissioner, and I have taken a great deal of interest in road building, and we have tried everything; we have tried brick, asphalt and everything else, and as one gentleman from Michigan said a while ago, the secret is maintenance. For illustration, when I started from Columbus, my wife overhauled my valise and found a button off my overcoat. She said "It has to be repaired before you can go." I only had fifteen minutes to make the train, but she sewed that button on, repaired the coat, and we have got to take care of these roads, we found that out. We have got six crews taking care of these roads. We have got the gravel roads, we take one of these crews to a gravel road, fix it up, roll it good and make a good road of it. We come to another road, water bound macadam, and we go to work and fill up the depressions. We see water in a hole right after a rain—we put stuff in, and roll it down with a roller. We have got good roads. We come along a tarred road and treat it the same way. We come along to one that is used too much; we cut it off, put it in good shape and roll it down. I've heard a good deal of discussion here; what you want to do is to get your Congressmen together and don't vote for a man unless he will tell you, on the honor of his word, that he will vote for building good roads from one end of the country to another. We have got a good highway commission. I noticed one farmer here; when I was building a road through his district, he didn't want it at that



time. I asked him "Why don't you want it?" He said, "Why, because these here city fellows with automobiles and these joy riders and all these people tear the roads up and we have got to pay for them." Now every farmer along that road has an automobile and wants more roads.

THE CHAIRMAN: The next subject is "Drainage Structures," by Mr. A. R. Hirst.

## WATERWAY STRUCTURES

By A. R. HIRST

*State Highway Engineer of Wisconsin*

Among the most important considerations affecting the construction of public roads is that of drainage. The life of every road structure depends upon the drainage given it, and the culverts and bridges necessary must be built not only to serve the purpose of drainage, but must serve also the convenience and safety of travel. The failure of a road results only in the additional expense necessary to replace it in proper condition, but the failure of a bridge results also in the suspension of travel, and if it occurs at the wrong moment, may cause considerable loss of property and possibly injury or death to those traveling the road.

For many years both the design and erection of highway bridges was practically entirely in the hands of the steel bridge companies, who used their opportunity to the utmost and decorated the landscape with structures which had little to commend them except the fat prices they brought from an unknowing public.

Within the last few years, however, many States have created highway commissions which have effectually taken up the problem of bridge design and a considerable change for the better has occurred, both in the strength of bridge superstructures and in the foundations, more especially in the latter, which was the place where most of the older structures were especially deficient, if one point of weakness can be selected from the mass of general ineffectiveness.

A properly designed waterway structure should fulfill the following requirements:

1. Waterway sufficient to carry off promptly the water coming to it.
2. Proper foundations to bear the loads, resist undermining, and give long service.
3. Superstructure designed to bear for a long period of years any load which may legally be imposed upon it.
4. Superstructure wide enough and so constructed as to serve the comfort and convenience of travel.
5. Economy of maintenance.

A sixth factor, that of aesthetic design and fitness of the structure to the surroundings, has been and is little considered in bridge and culvert design, but will probably be demanded more and more as public appreciation of the value of pleasing design grows.

In the short compass of this paper we cannot enter into a discussion of bridge design, or give any details of any specific type of structure. We will, however, give some account of our standard practice in the State highway work in Wisconsin, and probably this will be sufficient evidence of our views as to what constitutes a proper waterway structure.

Wisconsin is a State-aid State, and gives State-aid to bridges and culverts as well as to road construction. All waterway structures 6 feet and under in span are classed as culverts, and are built out of the funds available for the construction of the road. All waterway structures over 6 feet in span are considered as bridges and must be provided for by separate appropriations, the State paying 20 per cent of their cost instead of 33 $\frac{1}{3}$  per cent as in the case of culverts on roads.

Wisconsin has a drastic bridge law which provides that culverts under 18 inches in span must be so constructed or reconstructed as to stand without planking a load of 18 tons, and waterway structures over this span must be designed, "in accordance with standard engineering practice," to stand a load of 15 tons without planking.

In addition to the duty of designing all State-aid bridges and culverts, the State highway commission has imposed upon it by law the duty of approving as to their safety and engineering sufficiency the plans of all bridges constructed with county aid. In the seven seasons of the existence of the Wisconsin highway commission and its predecessor in highway work, the Wisconsin Geological and Natural History Survey, we have designed about 1000 highway bridges of a span exceeding 10 feet for counties, and about 400 bridges exceeding 6 feet in span, and innumerable culverts under this span for the State-aid construction. In addition to this, we have approved the plans for probably 500 bridges not designed by our engineers, but simply checked as to engineering sufficiency. Actual culvert and bridge construction under our own designs has cost about \$2,000,000.

We may roughly divide our bridge superstructures into five classes, as follows:

*Class 1. Spans from 18 inches to 10 feet.* Almost invariably constructed of reinforced concrete of the slab type. We are building even the smallest culverts of reinforced concrete, as we find in Wisconsin that they are entirely serviceable, easily constructed, and in probably 50 per cent of the cases cost less than any other type of culvert except wood, which is not allowed on any of our work. The smallest concrete structure we are now building is 18 inches by 12 inches, as we have found the smaller sizes equally as expensive and very easily blocked with ice and débris.



In some cases where the foundation conditions are extraordinarily soft and difficult, or concrete materials are not reasonably available, we use culverts of corrugated metal with concrete or stone end walls, but such culverts are used only where it is impracticable to use concrete, and probably not 1 per cent of our culverts are now built of this material. Vitrified clay is not used at all on State-aid work, as they have been found almost invariably to crack by filling and freezing. Concrete pipes molded in place and afterwards moved to the job are not used for the same reason. Under conditions favorable to their use, both make excellent culverts, and we could recommend them in less severe climates. Cast iron water pipe has not been used on account of its cost, which invariably exceeds that of concrete.

We find in the small concrete culverts from 18 inches to 10 feet the average cost per cubic yard complete, including the excavation and backfilling, is about \$8, and very seldom runs above \$10 per cubic yard; sometimes as low as \$6.

*Class 2. Spans 10 feet to 40 feet.* Either reinforced concrete, the slab type up to 18 feet and the through girder type up to 40 feet, or I-beam structures with concrete floors are used. We are building many true reinforced concrete bridges, but with public lettings open to any bidder, the workmanship and finished appearance has been so poor in many cases that we are using more I-beam structures than we otherwise would. In the case of I-beams, a 5-inch concrete floor is placed on top of the I-beams, and the corrugated arch type of support for the concrete between the I-beams is but seldom used.

*Class 3. Spans from 40 to 80 feet.* We are using the Warren riveted pony truss practically exclusively, though a few plate girders are being used where the conditions of hauling are favorable. All of these structures have concrete floors.

*Class 4. Spans from 80 to 135 feet.* We use the riveted Pratt high truss with a horizontal top chord, also with a reinforced concrete floor.

*Class 5. Spans over 135 feet.* We use a Pratt riveted high truss with a curved top chord. Practically all of these larger spans are also built with a reinforced concrete floor. Very seldom do we use a pin connected truss, either for Class 4 or 5, probably not once in twenty-five cases.

From our cost figures on all bridges so far constructed, we find that for any span the price erected (including substructure and superstructure) figures out very closely to \$40 per linear foot of the overall span. Reinforced concrete floors average about 20 cents per square foot. Steel in plate girder and truss spans averages from \$25 to \$70 a ton erected, and I-beam spans figure from \$50 to \$60 a ton erected.

We have adopted for widths for concrete culverts and bridges the standards recommended by the Association of State Highway Department, which are as follows:

*First class roads*

	<i>feet</i>
Culverts under 12-foot span, minimum width.....	24
Slab bridges over 12-foot span, minimum width.....	20
All other concrete spans, minimum width .....	20
Very long bridges less if necessary.	

*Second class roads*

Culverts less than 12-foot span, minimum width.....	20
Slab bridges over 12-foot span, minimum width.....	18
All other concrete bridges, minimum width.....	18

*Third class roads*

Culverts less than 12-foot span, minimum width .....	20
Slab bridges over 12-foot span, minimum width.....	18
Longer bridges may be, minimum width.....	16

Steel bridges are built almost invariably with a 16-foot roadway; that is, 16-foot clear distance between trusses or rails, no matter what the class of road, although for spans under 80 feet some 18-foot clear roadways have been built.

Abutments under practically all structures are plain concrete, as with concrete materials as cheap as we have them in Wisconsin, and with the difficulty of getting first-class workmanship in reinforced concrete foundations without constant inspection, we find that this is the cheapest type of abutment. Occasionally cement rubble masonry abutments are used, and once in many times driven steel I-beam piles surrounded by a concrete wall are used. The last type of abutment has been found to be very satisfactory and economical for high abutments on sandy bottoms, and has largely displaced the use of cylinders with steel backing. Steel backing is not allowed on any State-aid structure. The price of concrete in bridge abutments and piers averaged last year about \$8 per cubic yard.

A large share of the trouble with bridge structures results from improperly designed foundations. A common fault is stopping work before a proper depth below stream bed is reached. Seldom should foundations extend less than 4 feet below stream bed, and whenever doubt as to the bearing power of the soil at that point is entertained or as to undermining from a rapid stream, they should be carried down to solid soil or thoroughly piled. All foundation work should be inspected as the excavation is made and material is placed, not necessarily by an engineer, but at least by an honest man with good judgment and backbone. All concrete work in any part of the structure should be inspected as it is placed. Inspection of steel and workmanship on it as it is erected is not so necessary, as it can be inspected and its compliance with the specifications determined after erection at the time acceptance is to be given.

As to methods of letting the work. We have found it necessary to have open competition and sealed bids on bridge work, and by asking for mailed bids on all work have established true competition and have to a very large extent broken up the old system of "pooling," and combinations of the bridge agents who may be on the ground at



the letting. We furnish complete plans for foundations and for reinforced concrete, I-beam and plate girder spans, and all bidders submit prices on our uniform plans. For truss spans, we furnish the truss diagram showing the stresses in the truss members and the make-up of the truss members, floor system, and principal connections, and the successful bidder submits for approval the shop drawings before fabrication is commenced. For trusses we believe the latter system is preferable to that of furnishing complete shop drawings, as it allows manufacturers to follow their standard shop practice in detailing so long as these details are satisfactory.

The proper design for culverts and bridges is an engineering problem which should always be left to engineers. Probably a State highway department can handle it more economically than can private engineers, as so many bridges will be built of one span that superstructure plans can be standardized and even the same foundation plan may fit several bridges. The cost of designing, letting and accepting bridges in Wisconsin has averaged us about  $3\frac{1}{2}$  per cent of the total cost. Inspection has been paid for separately by the local units. It would probably be better to have a State inspector on each bridge, but we have gotten very good results through local inspection at probably 25 per cent of the cost of placing a man on each job. Important jobs should have a skilled inspector by all means.

The above discussion, I am afraid, when I read it over, is not as enlightening as could be desired, but I hope it may be of some interest, and if so, I shall feel repaid for the time taken to prepare it in our very busiest season.

**THE CHAIRMAN:** The discussion will be opened by Prof. T. H. MacDonald, State highway engineer of Iowa.

**MR. MACDONALD:** It is so near the noon hour that I do not expect to take advantage of the time allotted for the discussion of the paper, because in the main it represents standard practice throughout the upper Mississippi Valley States. The Association of the State Highway Departments of these States, which has been confined largely to these States, has directed during its meetings for the past several years, its attention to the proper design of bridges and culverts, and these departments all look upon the subject of highway bridge and culvert design from the standpoint of a State-wide proposition. That is, it is not so much a matter of the individual as it is a matter of adopting methods that can be standardized and designs that can be duplicated many times. For instance, all of the standard box culvert designs of the State highway commission of Iowa are duplicated so many times that in place of using an individual blue print for these structures, they are electrotyped and printed by the thousands and when we consider the drainage area of the State, like almost any of the Mississippi Valley States, Iowa I think with 54,000 square miles and under the law the State department

is responsible for the design or for the standard specifications governing the waterways through which all of the water from 54,000 square miles of area must pass, and we have found this to be the case, that in most cases, for the primary structure, those structures for which there is a small tributary area, which have no tributaries themselves, we have found that in most cases the area of waterways for these structures may be made less than is now the case; that is, it has been cheaper, in these States, to build a 16-foot bridge when planks were cut 16 feet long, than it was to cut the planks in two and make it 8 feet long, and so, for the primary structures, using Talbot's formula and blue prints, which we will not take time to discuss here, but which may be used for draining different characters of surfaces, we are cutting down the size of the waterway for all of the primary drainage area, but for all the secondary drainage areas, the inclination is to make these larger and I believe that if we are taught anything by the recent floods which occurred last year, it is that there must be some control of the streams which will provide for all of the secondary drainage areas adequate waterways; and with the limited time at my disposal, there is only one other point I wish to mention and that is the subject of federal patents as related to highway improvement, particularly relative to highway bridge improvements; it is my idea that the federal government should not issue patents for any type of highway improvement for which the government is not willing to take the responsibility. The State of Iowa, after a most careful examination and after the employment of legal advice, patent advice, put on its statute books last year a measure by which the State is empowered in any case in which the governor may think that the interests of the public demand, the State is empowered to intervene and take over the defence of any patent suit relative to highway improvement patents, and the State has already intervened in one such case, and it is my thought that it is necessary to examine the patents that have been issued in order that there will not be fastened upon the bridge industries as related to reinforced concrete designs, any royalty which is not proper, and we have the rather unique position of a State undertaking to defend its right against the federal government, which we have felt was somewhat jeopardized by patents which were issued. I believe the federal government patent officer should be required to take full responsibility for the patents which are issued, so that we will know they are really valid and should be entitled to the respect of all the engineers who wish to use the types of construction that are so patented. I thank you.

THE CHAIRMAN: We will pass over the discussion of this subject for the moment and get the other subjects before us. Next we have on our program the subject of "Brick Roads," which will be discussed by Mr. James M. McCleary, county engineer of Cuyahoga County, Cleveland, Ohio.



**BRICK ROAD CONSTRUCTION**

BY JAMES M. McCLEARY

*Road Engineer, Cuyahoga County, Ohio*

The road system of Cuyahoga County has received so much praise that anyone who claims connection with its development incurs danger of the charge of egotism, provided he omits to point out that the much heralded excellence was a gradual growth and that costly mistakes marred the county's early ventures into this realm of improvement. These mistakes were less due to wrong theories or practices of the engineers than to the demand of the taxpayer for a cheap improvement. Couple with this cause the eloquence of the material man who had something to sell that possessed practically no value as a road material. The extraordinary merits lay entirely in the blithe manner and quick tongue with which he persuaded the property owner that if his material were used—and his only—when Gabriel sounded his horn and we all answered that last call it would be clearly evident to said property owner that the Lord Almighty made a serious mistake when he paved his streets with gold and overlooked so valuable a substance as the patented article.

The failures of these various materials I shall not discuss, but shall deal with the mistakes of early brick construction, for it was by these earlier experiences that the present methods of building brick roads in Cuyahoga County were evolved. There was no sudden vault to excellence. We corrected our errors and gradually attained the type of highway which has won your attention. No peculiarities of topography or soil make this kind of road more appropriate in Cuyahoga County than elsewhere. To make this clearer, I will state that in the western part of the county the land is so level that drainage is a difficult problem and must be given much consideration. In the southern and eastern parts, the land is so broken that to secure a feasible grade without undue expense for excavation becomes the chief difficulty. The soil varies from a sticky yellow clay in the southern and eastern sections to a sandy loam at the west. The development of the brick road in Cuyahoga County, therefore, was obstructed by all the possible problems to be found elsewhere: natural and artificial soil, grades, climatic influences and the opinion of the abutting property owner, this latter being always ready of expression at every gathering where road building was considered.

The first brick road in Cuyahoga County was started in 1893 and completed in 1895 and located on what is known as the Wooster Pike in the southwest portion of the county. The wearing surface was of standard size brick, 8 feet in width, tar filled, placed between stone curbs, 3 x 15 inches and resting upon a 6-inch broken stone base. The pavement was placed upon one side of the roadway

with a graded earth drive occupying the balance of the width. No drainage was provided and really nothing of detail was taken into consideration.

The specifications were principally contained in the title on the back of their cover. So far as the contract was concerned, it provided chiefly that the contractor was to be paid in any event. If anything could open the eyes of blind justice, surely it would be this first contract awarded in Cuyahoga County for brick pavement.

No requirement in the specification dealt with the quality of the stone and the result was that the contractor gathered up field stone for his base and they were of such consistency that, when the roller had done its work, one might think that sand ballast had been used. Upon this the cushion was placed without compression and then the brick. As to the filler, no one could have told its composition at the end of six years, so little of it could be found.

The pavement being but 8 feet in width, all of the traffic came in one place. Lack of bond and absence of uniform support, caused a depression to appear. In the wet season, this rut or groove filled with water which soaked through the base, creating a worse condition from day to day during the damp seasons. The colder weather brought upheavals and such havoc that many sections of the improvement (so-called) were a hindrance rather than an aid to the traffic.

I anticipate your query as to why these defects were not repaired. Strange as it may seem the law under which these improvements were made permitted no expenditure for maintenance. In 1898 this legislative flaw was remedied, but for five years there was no chance to palliate the badness of our methods nor to interfere with the increasing dilapidation which constituted the chief value of this road—the value of a horrible example.

The next road laid was South Woodland. This is in the eastern section of the county. Again the wearing surface was 8 feet in width, tar filled and placed between flush stone curbs on a 6-inch broken stone base. We had learned, in a small way, from our first mistakes and placed a 6-inch drainage tile beneath the center of the road way. But on account of the soft filler and imperfect preparation for carrying off the water, but little improvement in the result was realized. An uneven settlement of the base soon resulted in roughness. For all of its shortcomings, however, I wish to state that when it was taken up three years ago to be replaced by a 30-foot roadway, its condition was such that by contrast, not every town or county could point a finger of scorn at it.

Lorain Road, our next installation, was built 16 feet wide, tar filled and resting upon a crushed stone and slag base between flush curbs, with drain tile beneath each curb. Subjected to an unusually heavy traffic, the almost inevitable result of such construction must be extensive repairs amounting almost to reconstruction.



Our next great forward step occurred when the tar filler gave way to a grout filler composed of one part sand and one part cement. This plan was followed until 1905 with success, at least in comparison with previous experiences. The cement filler alone could not cure all of the defects due to inferior drainage and frost action. Another step was therefore decided upon, the inclusion in the specifications of a requirement for a 4-inch concrete foundation which, of course, increased the price. State Road No. 2 was constructed under this plan. The increased cost brought immediate opposition, resulting in a temporary return to broken stone or slag base until 1908 when concrete was again adopted as a foundation and continued up to the present time.

I have gone into these experiences rather extensively for the purpose, as I said before, of showing you that the present method of building brick roads in Cuyahoga County is the result of a slow growth and not fruit of some revelation vouchsafed to an inspired engineer after a Welsh rarebit supper.

Since 1908 it has been the policy not merely to conform to the chief essentials of brick paving, namely, the properly prepared sub-foundation, the smoothly finished concrete base, the compressed sand cushion, the laying of good brick, the application of the cement filler to the joints, but to attach importance to minor details of approved manner and method of construction as will produce a road nearly approaching the ideal. I say "nearly" with much emphasis for I feel that in road construction there is always room for improvement. And doubtless we have not even yet given weight to certain details advocated by some of the more painstaking students of brick road construction in the country. Our approach however to the ideal at each successive effort has given to us roads which have received almost a world wide commendation and have given to Cuyahoga County the best road improved district of any like sized area in the world.

A satisfactory plan for an average rural pavement may include a paved portion anywhere from 9 to 16 feet in width, the width being controlled by the amount of traffic to which the road is subjected. A dirt or gravel macadam should occupy the balance or unpaved portion of width. Whatever dimensions are adopted, the surface drainage should be over the pavement toward a ditch on the side of the road closest to the pavement, eliminating a crown from the paved portion. The unpaved portion should be drained in the opposite direction.

Immediately you ask "Why a dirt road?" The best answer is, "Ask the farmer" and he will tell you to ask the horse.

The engineer will save himself much trouble if he holds to such a grade line as will entail minimum depths of fill. This is not always possible and it is the larger fills that call for the most extreme care. It behooves the engineer to see that his specifications contain a

clause calling for the fill to be put in layers of not more than 6-inch thickness and each layer compacted with a roller, not exceeding ten tons in weight. This clause must be enforced with rigidity.

Puddling is the one method that can be followed successfully in the treatment of old fills. The surface of the road should be broken and dirt removed from the center to the sides. At right angles to this trench, shorter trenches should be dug at intervals of twenty-five feet, forming a rectangular vat. Pump water into these compartments and allow it to stand until it has leaked its way into the fill. This will disclose the weak spots and the engineer can take care of them as he thinks best.

The drainage of the graded portion of the road is of first necessity. Whatever plan is adopted, the one that will most nearly maintain the sub-structure free from moisture below the frost line is the ideal condition to be sought. This means that you must not merely drain the road bed, but adequate side ditches must be provided to carry off promptly the accumulated water. In the preparation of a sub-base the only debatable proposition is the purpose of rolling. Common practice, including the use of a very heavy roller, has been founded upon the theory of compacting the soil to as great a depth as possible. This can do no harm but I am personally inclined to believe that the chief purpose of rolling is accomplished when the weak or spouty places in the soil are revealed so that the engineer can treat them as he sees fit.

For this purpose, a roller weighing from eight to ten tons answers every requirement. Preceding the final preparation of the sub-base the curbs must be placed. In case of most of our rural work, curbs are placed flush with the surface of the completed pavement.

With curb set and base prepared the next step is the placement of the concrete base, which with our roads has been 4 inches in depth. In specifying the proportions, a mixture of one-three-five with a permissible variation according to the size of the aggregates which will most nearly fill the voids, meets every necessity. To meet this variableness, which obtains with almost every job, it is necessary to specify the size of your course aggregate, but not the amount, requiring only so much of the course aggregate to be used as shall leave the concrete most nearly free from voids. This, instead of an inflexible rule of proportions, will relieve you of many arguments and will assure you a condition of concrete whereby a smooth surface is easily attained. A smooth surface you must have, for upon that much both of efficiency and durableness of your wearing surface depends. It enables you to accomplish in the next step a requirement of equal importance, that of placing the sand cushion of uniform fill and of uniform density.

While personally I do not place as much importance as some people do in the ability of the sand cushion to afford a resiliency or absorb the shock effect, it is unquestionably a necessity for the purpose of bringing the wearing surface of the brick to a perfect



plane, by neutralizing the unevenness and lack of uniformity of the brick.

No one will question but that the support of the wearing surface provided for by this sand cushion must be uniform. It is therefore necessary to compress and bring to a like density every part of this cushion. Dropping the sand cushion on to the base from dump wagons and leaving the bottom portion of the load untouched before striking off with a template is objectionable and renders the hand rolling difficult by having a dense pile and a loose pile to contend with, the roller spanning the looser portion. It is better to spread the sand entirely by shovels, than by rolling and striking off and re-rolling, even a third time. Thus you bring the cushion to a condition of compactness and even density that not only will furnish an even support to the entire pavement, but will prevent the sand from flowing up into the joints of the brick when the brick surface is rolled. While it is not necessary for this cushion sand to be entirely free from soil and vegetable matter, it should be nearly so, otherwise its density cannot be maintained.

It is needless to go into the specifications for the brick further than to insist on lugs on the side, and grooves on the end of the brick. I do not mean that there should be no specification for the brick but that it is the place of the engineer to determine by the class of traffic in prospect, what percentage of loss shall be tolerated as a maximum in the rattler test. Granting that you are satisfied with your brick, their laying is the next proposition.

1. See that the lugs are turned one way.
2. Make certain that the joints are broken so that one-third or more of the brick of one course overlaps the brick of the next course.
3. Be sure that every fourth course is driven up to a straight line.
4. For the sake of appearance, keep the line of the brick at right angles with the curb.

Next in order is culling. Care should be taken to see that all soft brick or brick that are burned too hard are removed. Those so heavily kiln marked that they will cause unevenness in the pavement should be turned. Caution should be exercised in this, for many a kiln marked brick is thrown out which, if allowed to remain would have been of more value to the pavement than others that are retained.

After the brick are thus placed in the street, their slight unevenness should be ironed out by the use of a roller not exceeding five tons in weight. If a horse roller is used at all, it should have a diameter of at least 5 feet. Rolling should begin on one side and pursue a course parallel to the curb. The roller should return over the same course. The next trip should lap the first, the roller again returning over the same course. This should continue until the center of the pavement has been reached when the roller should be moved to the opposite curb and continue as before until the center is reached from the other side.

The roller should then start at one side and work diagonally across the pavement. This diagonal rolling will have a tendency to bed the brick in such a manner as to avoid "rocker." The pavement should then be culled again for broken brick after which it should be hand rammed with a paver rammer weighing not less than fifty pounds. Interpose a plank not less than 6 feet long, 10 inches wide and 2 inches thick, between the surface of the pavement and the rammer. The plank should be laid parallel to the curb.

For filling joints, the next process in order, use a grout filler composed of equal parts of sand and cement. It seems hardly necessary to state that the cement should meet the standard specifications for Portland cement as adopted by the American Society for Testing Materials. The sand with which we have had much success has been taken from the lake and although not very sharp is nevertheless fine and clean and has given such good results that I cannot do otherwise than recommend its use. In any event the sand to be used should be free from sewage, acid or soil, and should be sharp and fine.

A watertight box, standing on uneven legs so as to afford a "lower corner" should be used as a receptacle for the grout. In it place not to exceed 1 cubic foot of sand and one bag of cement, mixing the mass until it assumes a uniform color. Add water and stir the mixture until it assumes the consistency of thin cream. The mixture should then be applied to the pavement by means of scoop shovels and thoroughly swept into the joints. After this has had sufficient time for setting a second coat, slightly thicker should be applied and later a third coat which will assure filled joints. This last coat should be worked either with a specially prepared broom or a rubber squeegee and swept across the joints at an angle of 45 degrees.

After the initial set has taken place, the pavement should be covered with a half inch or more of sand and this kept saturated with water for at least five days. The pavement should not be opened to traffic for at least ten days.

We have not undertaken any special provision against possible thermal effect, such as contraction and expansion due to low and high temperatures, but have relied mainly upon the condition of our structure by avoiding moisture underneath the roadway and by an endeavor to have our cement-filler at the greatest possible strength. These provisions, together with a rigid curb enables us to hold in compression, the expansion occurring in our narrow roadways. In this respect, we have not been entirely successful. A few cracks in the pavement have appeared, but so far, they have not ravelled out so as to injure the traffic worth of the road and have not been thought of sufficient importance to require repairs.

In trying to express the proven worth of such roads to the community, I am at a loss for words. Their economy has proven in contrast with any other methods of road building from the cheapest to the most expensive. I make this statement after comparing the annual maintenance cost of other types of good road with the utter



lack of any repair expense, on brick roads, due to ordinary wear. Our only repair expense has been caused by early mistakes in construction.

The fact that our roads are in shape for maximum service twelve months in the year and that they originate no dust has endeared them to abutting dwellers and to travelers from a distance. Washing by rain suffices to keep them clean and imparts a sanitary advantage which has been much emphasized by health authorities.

Perhaps the most eloquent praise is contained in the simple statement that, although we have built nearly 400 miles of such roads, thirty-three farmers petitions are now on file in our office, asking for thirty-three separate extensions. Local sentiment may be conservative, but it everlastingly catches on when it is shown something really good. We are no longer besought to make cheap roads, but to make good ones. Witness one case where assessments on a macadam road had still four years to run and yet so eager were the abutting owners for a better road that they threw four years payments into the discard and signed unanimous petition for brick. The petition was granted and brick laid, although it was necessary to scrap a relatively new macadam road to do so.

In a day when power traffic is imposing new tests upon road surfaces, and when the aggregate of all traffic is increasing so rapidly, I cannot avoid the feeling that we were fortunate in wasting little time and expense upon methods that could bring us no ultimate advantage. Our early experiments were often far from successful but they carried us along a course of evolution to something better than we could possibly anticipate. We must credit good luck alone for the fact that our venture dealt with a type of road peculiarly adapted to forms of traffic which could not be foreseen in 1893 when the experiments commenced. We can only claim credit for persistence in building year after year without a single omission for two decades, in refusing to be discouraged by failures and in availing ourselves of the only chance that any man can ask—the chance to correct his own mistakes.

**MR. R. KEITH COMPTON:** In opening the discussion on brick roads the speaker feels that the construction of brick streets is so interwoven and so closely allied with the road end of the proposition that a few remarks from him concerning the early construction of brick streets in the city of Baltimore might be somewhat interesting for this convention.

I suppose that every community in the early construction of its roads and streets has passed through the same experience as Cuyahoga County. As intimated in Mr. McCleary's very excellent paper, ten or fifteen years ago sales agents, lobbyists and politicians had more voice in the selection of road and streets materials than the engineer. Very frequently the engineer was forced to use against his better judgment either inferior material or material entirely unsuited for the

work which he had to do. Today, however, in almost every community, we find that the selection of the material is in the hands of men trained along lines which place them in a position to decide which is the best material for any particular road or street.

The first brick pavement laid in Baltimore was constructed about 1892 on St. Paul Street between Biddle and Preston Streets. It was laid on 4-inch base of concrete and a sand cushion anywhere from  $\frac{1}{2}$  inch to 3 inches in thickness. The brick was about the same size as the ordinary building brick, wire-cut, with straight edges, and of red shale. Instead of laying the courses at right angles to the curb, they were laid herringbone fashion, the most expensive way to lay a pavement. Sand was used as a filler. After giving twenty-one years service, one-half of the block has been renewed; the other half is still in fairly good shape. I cite this to show that even in the early stages of brick construction good and successful work was accomplished, along with failures.

We then came to the re-pressed brick, with lugs, and continued to lay brick of this character in small quantities until 1911, when the city of Baltimore had on its hands about 23 miles of vitrified block—some of poor construction, some fair and some excellent. Since January 1, 1912 to September 1, 1913, we have put under contract about 243,000 square yards, and have completed 182,000 square yards. Some of this work is on very heavy traffic streets, most of it is on medium traffic, while a small portion of it is alley work.

The old section of Baltimore, as many of you gentlemen probably know, contains many small alleys, varying in width from 10 to 20 feet. In the business section of the city these alleys are used for the purpose of delivering goods to the rear of the wholesale houses and warehouses, while in the old residential section they are used principally for the collection of garbage, delivery of ice, etc., so that you will readily see that in the business section it is necessary to have a material which will stand this severe traffic, while in the residential section there is not enough traffic on the alleys to keep a bituminous pavement alive; therefore we feel that brick is probably the best material to use in this instance.

Probably 5 per cent of our brick work so far is on a 4-inch base, with 95 per cent of it on a 6-inch base. We endeavor to follow the very latest and up-to-date construction, which is strictly in accordance with that outlined by Mr. McCleary, as follows:

#### A PROPERLY PREPARED SUB-FOUNDATION

If the sub-grade is of soft material and spongy under the roller, the contractor is compelled to remove it and substitute good material. The sub-grade is thoroughly rolled with a steam roller weighing not less than 5 tons. If of light sandy material, it is lightly sprinkled with water to prevent creeping under the roller, and also to prevent its absorbing too much water from the concrete.



## SMOOTHLY FINISHED CONCRETE BASE

While we do not use a template on finishing out concrete, the contractor is required to make it of such consistency and to ram it in such a way that it presents an even and smooth surface. On a 6-inch concrete base stone passing a  $2\frac{1}{2}$ -inch screen, and on a 4-inch base stone passing a  $1\frac{1}{2}$ -inch screen is allowed, to the extent of 20 per cent of the total mass, but in no instance must the longest dimension of any stone be over 3 inches and 2 inches, respectively, or one-half the thickness of the concrete base.

## COMPRESSED SAND CUSHION

I find that this is one of the hardest things to obtain. Our specifications first called for this cushion to be 2 inches in thickness. We found, however, that there was a tendency for some reason, both on the part of the contractor's foreman and the city's inspector, to exceed this, so that we finally reduced our cushion to  $1\frac{1}{2}$  inches, and owing to the smoothness of our concrete there is very little variation from this depth. We find that a  $1\frac{1}{2}$ -inch cushion is more easily compacted than a 2-inch cushion, and incidentally, the rolling and compacting of this cushion is one of the most important elements entering into the proper construction of vitrified block pavements, and too much importance cannot be given to the working out of this detail. When your sand cushion is not compact and firm you will find that your grouting is more apt to break and jump out, due to the vibration of the brick under traffic. Furthermore, the rumbling sound so frequently noticed from teams passing over a brick pavement is due in a large measure to your sand cushion not being compact, and for this reason I recommend a loamy sand for this purpose, preferably 10 or 15 per cent of loam, rather than a perfectly clean material.

The most practical way to determine whether or not your sand cushion is sufficiently firm is to step on it evenly but firmly, gradually throwing your entire weight on it. If an imprint is merely made, your cushion is sufficiently firm. If, however, there is a *decided* imprint, your cushion has not been sufficiently compacted, and your men should be compelled to re-roll and re-strike it.

## LAYING OF GOOD BRICK

In my judgment what you want is not a very hard brick. If too hard it is brittle, and will spall under traffic. They should be hard, well and uniformly burned, free from warps, fire-cracks and other defects sufficient to cause rejection. What you want in my judgment is uniformity. If you can obtain a uniform brick your street will wear evenly and will always present a good appearance if otherwise well constructed. If your brick are not uniform the wear on your street will not be uniform, no matter how well constructed otherwise.

Blocks when delivered on the street should be unloaded by hand and properly piled along the curb lines where directed.

As outlined by Mr. McCleary, care should be taken in laying brick to see that the lugs are placed all one way; otherwise you will have wide joints on the same line of brick, and your courses will be uneven and wavy.

The breaking of joints as indicated by Mr. McCleary is another very important item, and when cutting brick to fit in next to your curb the cut end should be placed away from the curb rather than against it. You will find that this will give you a street of much better finish. The same thing applies in cutting to fit up against the railway tracks.

In my judgment it is a great mistake to lay the brick too close, although it is also a great mistake to have too loose paving. If laid too close you will not obtain a sufficient amount of grout in your end joints to be of much service. If laid too loose, however, you will find that while rolling the brick will rock and the sand is apt to come up into joints. Incidentally, the sand coming up into the joints is a very important item and should be guarded against to the limit. While your brick are in process of being rolled the inspector should carefully follow the procedure, and if the sand cushion is coming up, the brick should be immediately removed and the sand cushion restruck, and if necessary re-rolled. The appearance of sand in the joints more than  $\frac{1}{2}$  inch or  $\frac{3}{4}$  inch seriously obstructs the admission of the cement grout.

I know of no better way to roll a brick pavement than that outlined by Mr. McCleary, except that in my judgment the use of a horse-roller is not practicable, but in all instances a steam roller should be used. After your rolling is completed to the satisfaction of the inspector, he should then proceed to look for broken brick and badly shaped or otherwise defective brick which escaped his notice during the process of laying. All of these should be removed, being careful at the same time to remove all chips which have fallen down on the sand cushion, good brick should be substituted, either by recourse to the pile on the sidewalk or by turning such of those in the street which have decided kiln marks on one side. All soft brick which may have previously escaped should be removed. A good way to locate soft brick is during and after the water is applied. They appear dry during the application, or comparatively so, and subsequently wet.

#### APPLICATION OF THE CEMENT FILLER

The speaker is a firm believer in a cement filled joint rather than a bituminous filled joint for brick pavements. Properly cement filled joints protect the edges of the brick, and give you a monolithic construction. A bituminous filled joint does not protect the edges of the block so well and does not present a monolithic construction. I have seen bituminous filled streets completed in the most workman-



like manner and the street left with a good even surface. Two years later the brick have been rounded on the edges, and the surface has become decidedly uneven, the brick having shifted and floated on account of the bituminous filled joint.

Some years ago we tried a cement filler mixed two of cement to one of sand. We found this too brittle, and at once substituted the regulation filler of one to one. If this filler is mixed and applied as outlined in Mr. McCleary's paper, you should have no trouble, but it is imperative that the minutest detail of the selection of the sand, the cement, the mixing, application, and the covering with sand after the filler is otherwise completed, be complied with. The slightest deviation from one of these details is more than likely to cause you trouble.

It is bad practice to follow too closely the application of the filler with your sand cover. The sand cover can only be used for two purposes: (1) either to protect the cement filler from the hot rays of the sun, or (2) protect it from frost, depending of course upon the time of the year your work is under construction. It is very important that your application be so regulated that two or three hours should elapse between the time that your filler is completed and your sand cover is applied; otherwise, a too early application of your sand will not only cover up slack joints, but may seriously weaken the cement filler.

As is well known, the installation of the transverse expansion joints are unnecessary, the only necessity being the side joints next to the curb. Every precaution should be taken to have those joints free of foreign matter so that your pavements will have, in case of expansion and contraction, the full advantage of a clear joint filled from the top to the bottom with either a good bituminous filler or the patented elastic joint.

For thickness of joint, the speaker finds that the following are about necessary:

On streets between 30 feet and 50 feet in width,  $1\frac{1}{2}$  inches next to the curbs.

On streets between 20 feet and 30 feet in width, 1 inch next to the curbs.

On streets between 10 feet and 20 feet in width,  $\frac{3}{4}$  inch next to the curbs.

If all of these details are strictly complied with you will have a road or street consisting of the following: (1) durability, (2) ease of traction, (3) moderate maintenance, (4) sanitary, (5) pleasing appearance, (6) it will be a pleasure to either drive or motor over them.

THE CHAIRMAN: I will ask Mr. Blair to continue the discussion of "Brick Roads."

MR. BLAIR: I do not want to take the time of anyone else who wishes to speak on this subject. I think Mr. McCleary deals in detail very carefully as to the progress that has been made in Cuyahoga County in brick road construction. I do not think that even in Cuyahoga County they have reached perhaps that perfection in

construction that is easily attainable, and in spite of the fact that they have reached entire perfection in that county, they have built roads of brick that have not cost, due to wear and tear, anything for maintenance whatever. Some calamity, some little defect in the early construction, has led to the necessity for repairs on a few of the roads, but the system is certainly a wonderful one in view of the fact that it covers a period of twenty years. Many of the roads in that county from ten to fifteen years in use, have not called for any repair whatever. So I think that Mr. McCleary and the commissioners of that county have accomplished really a great work, and it furnishes an example that might readily be copied by a great many communities where the roads in such communities are subject to excessive use and excessive wear, as they are in this county. I am a great believer, myself, in the construction of a brick road on excessively used highways. This Convention, up to this time, has been pretty nearly a discussion of repair and maintenance. I differ somewhat from some of the speakers in that particular, because I believe that we want to arrive at a better information, at better ideas as to how to construct roads of the particular sort that will render service without this dreadful cost of maintenance. I know that what has been said upon this floor is largely from the viewpoint of the speaker. We have heard it said upon this floor by some man from a sand district in North Carolina, that the roads there are wonderful roads and they suit that community. We have heard on the other hand some speakers upon this floor who have praised highly the gravel roads in Missouri. It is from the viewpoint and surroundings of the speaker and it is from a comparative sense that we speak of these roads. The roads that are so highly praised by the gentleman from Missouri would not answer the purposes of many communities in this country, they would not stand up against the tonnage that is raised from 640 acres in the farming districts of central Illinois. They would be all cut to pieces; so I am a firm believer in the selection of road material that is adapted to the community and where we have excessive use of roads and highways, we must build accordingly and we must select the material accordingly, if we would have our system an economic one.

MR. RIGHTER (of New York): I would like to know why the manufacturers cannot furnish a brick that is of less depth than 4 inches. A large part of the cost of brick pavements is the cost of brick, and it seems to me that a brick will have to be designed that is 3 or 3½ inches in depth, so that freight can be reduced. There is a large demand for concrete roads and they are cheap. Brick roads are more expensive. I would like to know if a brick cannot be designed that will bear the traffic and yet be of lighter weight. I have been told by some of the manufacturers that the reason bricks are made 4 inches deep is that the culls can be used in building operations, and that is the reason for making them 4 inches deep



and adding to the cost of freight and handling. I think it is up to the brick companies to furnish a brick that will be lighter.

MR. BLAIR: I may answer that question very much in the same way, following what I have already said. The manufacturers of brick in this country have undertaken to furnish the brick that is best adapted to the uses to which they are likely to be put. We do not believe that it is economic for you as a tax payer or you as an engineer to use a brick that is much less than 4 inches deep. There are certain elements against which the road must be made to bear up and support; these are taken into consideration in the manufacture of a brick 4 inches deep. It is easy enough to manufacture a brick  $3\frac{1}{2}$  or  $2\frac{1}{2}$  or whatever depth you please, so far as that is concerned, but it has not been a proposition wholly selfish except in the sense that, through self interest, we are giving a brick to the users of brick in this country that we believe is best adapted for the use to which it is to be put and that will best serve the economic idea.

MR. SMITH: I would like to ask the cost of a 16-foot brick pavement on a country road.

MR. McCLEARY: In the western part of the county, grading is a small item, and in the eastern part it is a large item. In a job of 2.6 miles, the grading alone was \$11,000; grading a road 42 feet wide, ditches 2 feet deep.

MR. SMITH: I asked the question to compare it with other figures I have in various parts of the country.

MR. McCLEARY: That is taking care of an expensive road in the eastern part of the county.

MR. BLAIR: I think, eliminating the grade or with a grade at a minimum, through a level country, the cost of a brick road may be said to be approximately \$1000 per foot in width, per mile in length; that is on a 4-inch concrete base such as Mr. McCleary describes in his paper, as being the recent method of building pavements, 9 feet, \$9000; 16 feet, \$16,000, etc.

MR. THORNILEY: In Washington County last year we built a mile of macadam road. The specifications called for two kinds of roads, one of brick and the other concrete. The road that was let was concrete, at a cost of \$12,100 a mile. They did offer brick for the same road, a 16-foot road, at \$16,000 a mile.

THE CHAIRMAN: The next subject is "The Selection of Road Material," by Hon. L. W. Page, Director U. S. Office Public Roads, Washington, D. C.

## THE SELECTION OF MATERIALS FOR MACADAM ROADS

BY LOGAN WALLER PAGE

*Director U. S. Office of Public Roads*

Of all the factors which go to make up the perfect macadam road, there is undoubtedly none more potent than that of the suitability of the material which enters its construction. A road may be located, drained and constructed along the very best lines and according to the most approved methods and be a total failure if the material of which it is built has been poorly chosen. It is perhaps not too much to say that large sums of money are wasted annually in this country because too little importance is attached to this phase of the road problem. The engineer is then, at the very outset, confronted with the important problem of selecting the most suitable material for his work, and on the care with which he performs this task depends in a large degree the success or failure of the road he is to build. The purpose of the present paper is to discuss in some detail the methods which may be used in approaching this problem, with special reference to the value of laboratory tests as an aid in the selection of suitable materials for roads.

There are two ways in which the engineer may avail himself of the information necessary to a proper selection of a road material. The first and only certain one is to make an actual service test on the material under observation, and under the same conditions of traffic and climate to which the proposed road will be subjected. This method is, of course, impractical except in certain rare instances, due to the length of time which must elapse before definite results can be obtained. The second method is, by means of short time laboratory tests to approximate as nearly as possible the destructive agencies to which the material will be subjected on the road, supplementing the knowledge thus gained by a study of the results already obtained in practice on material of a similar nature.

The laboratory testing of road building materials originated in France over forty years ago, and was introduced into this country by the writer in 1893, when he became director of the road material laboratory of the Lawrence Scientific School at Harvard University. The United States government became interested in this work shortly afterwards, establishing, in 1900, a laboratory in the department of agriculture, at Washington. This laboratory is now a part of the office of public roads, and has thus been able to give much assistance throughout the country in regard to the proper selection of material for macadam roads.

The three most important properties which a rock should possess in order that it may successfully resist the destructive agencies to which it is subjected are hardness, toughness, and cementing value.

Hardness, from the road builder's point of view, may be defined



as the resistance which a rock offers to the displacement of its surface particles by friction. It is well illustrated in practice by the grinding action of iron tired vehicles which tend to reduce to dust the rock fragments of which the road is composed. This property is determined in the laboratory by a special method, the essential features of which are as follows:

A core 25 mm. in diameter is drilled from a sample of the solid rock by means of a core drill. After being accurately weighed, it is held in a perpendicular position against a cast steel disc revolving at the rate of thirty-three revolutions per minute, while crushed quartz sand of a standard size is fed upon the disc to act as the abrasive agent. After 1000 revolutions of the disc, the core is again weighed, the loss calculated, and a measure of the hardness of the rock thus obtained.

Toughness, or resistance to impact, is a measure of ability of a road material to resist the pounding action of traffic such as is caused by the shoes of horses, etc. It is determined in the laboratory in the following way:

A cylindrical test specimen of the rock 25 mm. by 25 mm. is taken from the core used in the hardness test, and subjected to the impact of a 2 kgm. hammer through a spherical end plunger in a machine especially designed for the purpose. The test consists of a 1 cm. drop of the hammer for the first blow, followed by an increase in the drop of 1 cm. until failure of the test piece occurs. The height of blow at failure is taken to represent the toughness of the specimen.

The combined effect of the mechanical agencies causing wear is very effectively determined by means of the Deval abrasion test, which has been the standard for over thirty years, and which is conducted essentially as follows:

Five kilograms of the rock to be tested is broken so as to number as nearly as possible fifty pieces, and is placed in an iron cylinder, mounted in such a way that the axis of the cylinder is inclined at an angle of 30 degrees with the axis of rotation of the machine. After 10,000 revolutions of the machine at the rate of thirty-three per minute, the material is taken out and sieved through a 0.16 cm. sieve, the material passing being that used in calculating the percentage of wear.

The cementing value of a road stone is that property which causes the fine rock dust to act as a cement and thus bind the coarser fragments of which the road surface is composed into an impervious shell. A laboratory test to determine this property was devised several years ago by the writer, and is conducted substantially as follows:

Five hundred grams of the material to be tested is broken to about pea size, and placed, together with a sufficient quantity of water, in

an iron ball mill. Five thousand revolutions of the mill reduces the mixture to the consistency of a stiff dough, which is moulded by means of a hydraulic moulding machine into cylindrical briquettes 25 mm. by 25 mm. in size. After drying twenty-four hours, these briquettes are tested by impact in a machine especially designed for the purpose. A 1 kgm. hammer falling upon an intervening plunger, which in turn rests upon the test piece, is allowed to drop from a height of 1 cm. until failure of the specimen occurs. The number of blows causing failure is used to represent the cementing value of the material.

It will readily be seen from the foregoing that a very accurate preliminary idea of the properties of a road stone may be obtained by means of laboratory tests. Many years' experience in testing these materials have made it possible to adopt certain standards of excellence which, when used intelligently and in conjunction with the other factors in the case, are of much value in selecting suitable materials for water-bound roads.

The results of laboratory tests alone, however, are not sufficient to judge of the suitability of a rock for road building purposes, unless supplemented by additional information as to, (1) the character and volume of the traffic to which it is to be subjected; (2) climatic conditions under which it is to be used, and, (3) its name and general character, including, if possible, its mineral composition. In addition to the above, consideration in any specific instance should be given to such matters as the availability of the material, especially with reference to cost, transportation facilities, etc.

The value of taking these factors into consideration will be briefly illustrated below.

It is a well known fact that a given road rock is far from being equally well suited to different traffic conditions. A high grade trap rock would be as unsuitable as it would be uneconomical on a road subjected to light traffic, in that the dust worn off would not be sufficient to bind the coarser fragments together, and the road would consequently ravel. On the other hand, the comparatively soft limestone which would be well adapted for the light traffic road would quickly pound to dust if subjected to conditions which would hardly affect the trap.

As a general rule, it may be said that the ideal rock for any particular road should be just so hard and tough that the fine material worn off by the action of traffic would be sufficient to supply that lost by the physical agencies of wind and rain. By correlating the information obtained by observing the behavior of the various rock types under different traffic conditions, with the results of laboratory tests on material similar in character, it has been found possible to determine quite definitely under just what conditions any given material would be most suitable, even before it had ever been used in road construction.



Many years of observation of the behavior of the various road building rocks in service has demonstrated the fact that, as a general rule, certain classes of material possess for particular purposes distinctive advantages over others. It is obviously of advantage, therefore, to know the general type of the material under observation, in order that an intelligent comparison may be made between it and the material of a similar nature which has already been used. The different varieties of trap, for instance, such as diabase, basalt, etc., are generally considered to make the most satisfactory road material, especially when the traffic is heavy enough to supply by wear the dust lost from natural causes. The limestones, as a class, being softer and less tough are, as a rule, better adapted for light traffic than the traps. Laboratory tests in these cases are, therefore, mostly of value in enabling the engineer to make a definite choice between a number of materials which in a general way might be considered as suitable for his work.

The granites, owing to lack of toughness and cementing value, are, as a rule, only suitable for the foundation courses in plain macadam construction. Here the value of taking into consideration the character of the rock tested may be illustrated by the fact that frequently granites are found by laboratory tests to have good cementing values, due to highly altered minerals, when, as a matter of fact, such material should not be used on account of the ease with which it disintegrates under traffic.

Foliated material, such as gneiss, schist, slate, etc., should never, of course, be used when better material is available. Material such as quartzite and marble should also be avoided, the first on account of its hardness and lack of cementing value, and the second because of its crystalline structure and general lack of durability.

The availability of various materials considered for use in road construction should, of course, be considered, and is highly important, especially from a financial standpoint. In considering this point, however, care should be taken not to lose sight of the other factors in the case. Experience has shown in innumerable instances where poor material has been used because it was cheap that money would have been saved in the long run by the use of a superior rock, even though shipped from a distance and costing considerably more at the outset. There are cases, however, where local material may be used advantageously. It is in such instances as these that engineering judgment, combined with laboratory results, is necessary for proper selection.

An accumulation of data resulting from the great number of tests made on road building rocks in the government laboratory has quite recently made possible some very interesting investigations concerning the relation between the properties of hardness and toughness. By plotting numerous values of these tests, it was found that, in a

general way, hardness increases with toughness and that, whereas for low values of toughness the hardness was extremely variable, as the rock became tougher the hardness showed less and less deviation from an average of the plotted points. The significance of this fact is that the property of hardness appears to be invariably associated with that of toughness, although the reverse is not the case. It seems, therefore, that for a quick determination of the qualities of a road building rock, the hardness test might possibly be omitted, since material which satisfactorily passes the toughness requirement invariably appears to be hard enough for use in road construction.

When rock is to be used in bituminous construction, the importance of some of the above-mentioned tests is diminished. The cementing value, for instance, may be practically disregarded when the use of an artificial binder removes the necessity for dependence upon a dust bond. A tough rock is, of course, preferable, and more especially when the surface is to withstand the shock of heavy traffic, but both toughness and per cent of wear become less important in the body of the road with bituminous construction when the surface is maintained by occasional surface treatments to preserve a wearing mat with a hard and tough aggregate.

Since public health and comfort have universally demanded an abatement of the dust nuisance, and economic maintenance is correlated with their demands, a few words on the selection of dust preventives and road binders can not be out of place in a discussion of materials for macadam roads. The selection of a form of treatment or construction must be governed by a full consideration of the volume and character of traffic which the road surface is called upon to carry. In rural sections where a macadam road is subjected principally to the average farm traffic and a relatively small number of automobiles, a surface which is in good condition at the outset may be economically and satisfactorily maintained by an occasional application of one of the lighter dust laying tars or oils. The purpose in a case of this character is simply to preserve an already good surface by keeping the products of wear saturated with a material that will prevent them from being removed from the road surface. The purpose is readily best accomplished by a product that is not possessed of marked binding qualities—a material that will not pick up nor "ball" when mixed with dust only. Hygroscopic salts and other non-bituminous dust preventive have also served the above purpose successfully where climatic conditions favor their particular characteristics.

The value of a simple dust preventive decreases, however, with an increase in the volume of automobile traffic, and a more permanent form of wearing surface then becomes necessary. Up to a certain limit, and particularly on park roads, this character of traffic is successfully provided for by means of an annual surface treatment of oil or tar covered with cleaned screenings or fine gravel. For cold



surface treatment, the oils which give particular satisfaction are the natural or partially refined products which, through laboratory tests, are shown to consist of low-boiling constituents carrying in solution a relatively high amount of heavy adhesive asphaltic base. For most successful surface treatment, it is essential that an oil shall develop decided adhesive qualities in the residue from the standard volatilization test at 63°C. Tar products should be free from water, and it is believed that their value for surface treatment increases with the decrease in the free carbon content.

When the traffic becomes of such a character and magnitude as to cause a too rapid deterioration of a surface mat, the macadam must be constructed or resurfaced with a heavy binder as an integral part of the upper 2 or 3 inches of the wearing surface. The selection of a binder, whether it be a tar or asphalt product, now becomes dependent on several factors, among which the method of construction, character of the aggregate, and climatic conditions are most important. For instance, a dense aggregate may permit of the use of a lighter tar than will a poorly graded one; or a lighter tar or softer asphalt product would be specified for northern latitudes rather than for use in the south. A single standard for all materials and conditions can not, therefore, be established, but with the various factors in mind, a specification can be drawn to cover the consistency and desirable chemical characteristics. In fact, in the purchase of road materials for whatever purpose it should be to the advantage of the producer as well as a protection to the consumer, that a definite specification be required. All shipments when received should be submitted to laboratory tests that will insure fulfillment of these specifications.

THE CHAIRMAN: Has anyone of you any question you wish to ask Mr. Page? If not, I desire to introduce to you Judge Joseph Asher, of Arkansas, who will address us a few moments.

#### ADDRESS BY JUDGE JOSEPH ASHER

I come from the great State of Arkansas which is pretty nearly square in shape and 54,000 square miles in area. It is the land of tall trees, cotton, corn, rice, fruits of every kind, stone of every kind, coal and diamonds; we have all of these things, and at the same time we would like to have good roads. The constitution of 1874 forbid the county or State to issue any interest bearing bonds, hence we cannot borrow any money for internal improvements of any kind, but the Good Roads' people, about twelve years ago, got together and passed an amendment to our constitution which authorized the voters every two years to vote on the subject of levying a

3 mill road tax, and since then we are progressing in road building. Every two years the question is submitted to the voters and carries by large majority. The country boy appreciates the fact that in case he does not vote the road tax, he works ten days on the country road; in case he does he only works four. You understand we have no cities in Arkansas like you have here, we have only \$500,000,000 valuation and a 3 mill tax on that gives us \$1,500,000 a year. We found out that the constitution did not limit us on an improvement district, and three or four years ago, our legislature passed a law that we might form improvement districts in the country the same as they do in the city, and assess the benefits against the abutting acreage property, and under that law Pulaski County has put down about 30 miles of macadam road, besides 140 miles built without this assistance. The improvement district usually laid out is a territory about 2 miles on each side of the road to be improved on the request of the people living in that territory, representing a majority of the assessed value who signed the petition. The county out of its general fund pays one-third to one-half of the expense, abutting property pays the rest. We found that it worked like a charm. We are coming along and building good roads without much trouble. The people have a lot of interest in it, as it is largely at their personal expense. When they find they are paying something like \$4000 or \$5000 a mile, they are ready to take hold of it; not a man grumbles. We assess them according to the benefits. The county court appoints a board of commissioners, they appoint assessors and they meet and say "We are going to assess the benefits for building this road; come and meet us and see that we do each property owner right, or show us that we are wrong and we will right it." We assess the land in bottom river country, where the land is rich, \$2.50 to \$7 an acre for that road. Everybody is satisfied. Another law under which the legislature may form special improvement districts if the legislature finds it will accrue to the benefit of the country is also in operation. The last legislature put itself on record and put through 200 miles of first class road. Some of that road will be the same as you have in Wayne County, concrete road; another portion of the road is a good macadam. We believe that the fairest way to assess the road proposition is that the people who use the road pay for it, and it is working entirely satisfactory. We have no trouble organizing those improvement districts. The only trouble is that much of our territory is not assessed high enough to sustain a large assessment. I believe that these suggestions might work in some other locality; other States. It is new with us. Our courts have held it good and I believe it would hold good in other Southern States that are similarly encumbered as ours.

THE CHAIRMAN: Gentlemen of the Convention, I desire to read to you a telegram which I have just received from President Dell



M. Potter, of the Southern National Highway Association, whose home is in Arizona. On behalf of the Southern National Highway Association he extends to you greetings and wishes you success in all your undertakings, and regrets that he is unable to be present.

Adjourned until 2.30 p.m.

## CONTRACT SESSION

UNDER AUSPICES AMERICAN SOCIETY OF ENGINEERING CONTRACTORS

October 1, 2.30 p.m.

J. R. WEMLINGER, Chairman

**THE CHAIRMAN:** The meeting will please come to order. Mr. Rickey has a resolution to offer and I will ask him to read it.

Mr. Rickey offered a resolution favoring the creation of a department of public highways which was referred to the committee on resolutions.

**THE CHAIRMAN:** Mr. W. L. Bowman will present a paper on "Legal Suggestions Respecting Road Contracts."

### LEGAL SUGGESTIONS RESPECTING ROAD CONTRACTS

BY WILLIAM LAW BOWMAN, C.E., LL.B.

*New York Bar*

Etymologically and technically the word "contract" should mean an agreement enforceable by law. "The law of contract may be described as an endeavor of the State . . . to establish a positive sanction for the expectation of good faith which has grown up in the mutual dealings of men of average rightmindedness." How do our present public contracts for road construction and their interpretation by officials satisfy these old definitions. As a part of the great work of properly linking our States and their cities and towns with uniformly good roads, it is incumbent upon us to better and if possible make uniform the contract conditions respecting the construction work and to secure that coöperation and esprit-de-corps between officials, engineers and contractors which alone will give us the best roads for the least money with a minimum of trouble and wasted energy. It has been wisely remarked that "you get only what you pay for" and in the long run that is as true in road construction work as in any other field.

Let us first consider some general principles respecting states, municipalities and roads which should be known in order to appreciate the special subjects which will be considered.

The State is a sovereign body and as such is not responsible by action at law or in equity. There are a few isolated cases holding that when a State goes outside its governmental capacity, it may then be sued in the federal court. No dependence however can be



placed upon these decisions by a contractor. The result is that a contractor with a State has no way to enforce his contract rights nor to secure redress against official oppression unless the State legislature has provided therefor. The best and usual plan is the formation by the legislature of a court or board of claims to hear and determine claims against the State, its departments and boards. One State allows a contractor to sue it provided the legislature passes a special bill for the specific matter. The value of that right is well illustrated by a statement made to the writer by an offending official that when he got through with the matter I would have to have more political influence than he thought I had in order to get such a bill through the legislature. It is also the general rule that in such instances the offending official himself is beyond the legal reach of the contractor. Thus it is that except in those States having a court or board of claims, official oppression and even financial ruin can be honestly or dishonestly caused without any hope or prevention or redress for the contractor. A so-called agreement where the contractor depends solely upon the action of an official and his engineer should not be called a contract. It violates the true meaning and our understanding of that term. This inability of a contractor to enforce his contract rights or even to demand fair play and justice cannot but be detrimental to good economical road construction. Under such circumstances the work becomes political—only favorites dare bid or accept contracts—and the other results of political work naturally follow.

Due to this fact that most States could not and still cannot be compelled to live up to their contract conditions, the terms of a State contract have been considered practically unimportant by the contractor. He knew that he must follow the directions, the plans and specifications called for. While conscientious and honest officials and engineers predominate in State work yet they at times need the restraint which a chance to be heard by the contractor affords. Furthermore the atmosphere and the mental attitude of all concerned is bad in such a situation. Those opposed to granting the contractor this right to properly and legally present his claims before a disinterested court or party will be interested to know that even so great a sovereign as Emperor William of Germany last year lost an action to one of his tenants in the German supreme court over the value of certain improvements. Therefore unless a State has a board or court of claims open at all times to those contracting with the State, its departments and boards, or unless it provides for a submission to an impartial and disinterested arbitrator or arbitrators any changes in the present State contracts that are discussed or suggested will of course be useless except as they may influence the controlling official. In this connection it has been very noticeable that both the judges and the juries favor the State or municipality when they are sued. This is even found where it is necessary to construe the iron-clad terms and conditions of our present day one-sided agreements which

are required to be signed by those desiring to engage in public work and where it would be expected there would be some sympathy for the contractor. In all seriousness then, it is submitted that there seems to be no logical reason why the contractor should not be given an opportunity to get a square deal if he believes he is not being fairly or honestly dealt with.

Municipalities are the legal creatures of the legislature, and their powers and rights must be found in the law creating them. Throughout this paper the term municipalities will signify cities, counties, towns, boroughs, road districts, etc. As a governmental agent, a municipality is immune in respect to mere errors of judgment but in its ministerial capacity it is liable for consequences of negligence and maladministration. As regards plans for public improvements some courts attribute negligence to a municipality in the adoption of a defective plan and the test of the liability of a municipality which causes injury is not the fitness of the engineer but the efficiency of the work. Where a defective plan is the result of bad faith or oppression or is so clearly unreasonable as to inflict needless injury a court may enjoin performance or if the work is completed hold the municipality responsible.

Roads are in the control of the State. In doing road work a municipality acts as the agent of the State performing a public duty imposed by law. On this account those dealing with either roads or municipalities must ascertain the legislative acts pertaining thereto as a basis for any serious investigation. In determining the powers or rights conferred by such statutes the investigator must remember that the wording of the law will be strictly adhered to and that the tendency is to restrict powers granted and to deny any implied powers or rights.

Since a contract may be either wholly void or voidable at the option of the State or municipality unless certain preliminary steps are properly taken and since in such instances it usually results in a total or partial loss to the contractor of his compensation for work done and material furnished it is essential that a brief warning in this regard should be given.

With respect to roads; the proceedings to acquire the land; the report upon the advisability of a road; the estimate of the cost; the description of the road; the survey and resurvey; the proper sanction of the voters or taxpayers; the proper formation and action of the boards or courts, etc., all must be in compliance with the statutes and laws pertaining thereto. In addition the actual preliminaries to the contract itself must be regularly and legally complied with: A proper and sufficient appropriation or available funds; a proper advertisement for bidders; a proper letting to a proper party; a properly constituted board or official acting strictly in accordance with its or his authority; a proper bond for performance, etc. The contract itself must be in the required form properly executed, for the purposes allowed by the special statute, with proper persons en-



titled both to give and to have such contract and in accordance and in conformity with the preliminary reports, plans, specifications, survey, description, etc. As has been previously stated, failures, omissions, or negligence on the part of any of the State or municipal officials or agents in the above respects may cause the contractor to lose his compensation for work done and for benefits actually conferred by the contractor. There are some decisions and some statutes which are based on equity to prevent such unjust enrichment of such bodies at the expense of a contractor but it is not safe to rely on such law in any particular instance. The general rule may be likened to the ancient rule of "caveat emptor" or as it might be expressed here "let the contractor beware." This warning, while primarily for the contractor should be taken to heart by the official who is trying to do right and be honest since usually he is the unfortunate party that causes the contractor's troubles and losses.

#### CONTRACTS

As we have already seen, most present day state contracts for road construction are not really "contracts" because of the inability of the contractor to sue thereon. In addition I have also seen one State contract which stated that "all right or rights of any action at law or in equity under or by virtue of this contract and all matter connected with it and relative to the same are hereby expressly waived by the contractor." Practically the same result is accomplished by other States and especially by municipalities by the requirement that upon or before final payment the contractor must execute a release in full of all claims arising out of or by reason of the work done and material furnished under the contracts. Is this *good faith* in the dealings of men of average right-mindedness? I cannot conceive of but one answer to this question. The remedy is then simple. Provide either fair and disinterested boards of arbitration to pass upon a contractor's claims or provide a court of claims and eliminate any waiver of appeal to such arbitrators or court and the general release as a condition precedent to final payment from all road construction contracts. In other words give the contractor a chance for a square deal upon a two-sided mutually agreeable contract. In passing it might be noted that the United States government is probably the worst offender in this matter of unfair and objectionable clauses, including that requiring a release, and it is setting a disgraceful example for the States and municipalities.

#### SATISFACTION CLAUSES

It is probably a safe statement that there is no State or municipal contract in use today which does not provide for the "satisfaction" of some official, board or engineer, or all combined. Is this a necessary, fair and honest requirement in road construction contracts or

is it merely a club to compel the contractor to do what the official or engineer wants regardless of the plans and specifications?

In most States it has been properly held that this requirement merely necessitates work satisfactory to the mind of a reasonable man. Thus if the work has been performed substantially in compliance with the contract, the law will hold the official, engineer, etc., to be satisfied. With plans and specifications so clear and concise as they generally are in road construction, and especially with the work required to be done "under the direction" of an engineer and under constant inspection, it would seem that legal satisfaction would be presumed in 99 out of 100 cases and hence the use made of this requirement in such States would be merely to bluff or bulldoze the contractor. In no way does it improve the requirements of the plans and specifications.

In such a State as Pennsylvania where work can be held unsatisfactory by the official or engineer even though the plans and specifications are rigidly adhered to and where only honesty of purpose is required, the result of such a contract requirement may be heart-breaking. Under the guise of dissatisfaction I have known an official in that State to deliberately violate every essential provision of an agreement and to settle at his own figure with the contractor; or in plain English to rob the contractor not only of his contract right but also of thousands in money with no redress. A contractor who accepts State work in a State where this personal satisfaction of private taste in road construction is required must understand that he is at the beck and call of the official or engineer regardless of his contract requirements and conditions. What could the contractor in such a State do when he has to satisfy not only the engineer in charge, but the road commission and a State board? Suppose the work satisfied one and not the other two, or two and not the third party?

Our considerations recommend that "satisfactory" requirements be dropped from road construction contracts as either unnecessary, harmful or unfair and as not being a sanction for the expectation of good faith between men of average right-mindedness.

#### CONTRACT WORK

In looking over many of the latest forms of road construction contracts it is noticeable that there is a very decided improvement in the manner and method of setting forth the contract work and specifying what is variously designated as alteration, additional, miscellaneous, or extra work, etc. Road work is now generally specified in various units and a price bid for each respective unit. In one such contract we find this definition: "Extra work is any work in connection with the execution or completion of the contract for which no price is included in the proposal sheets and contracts." Compare this simple and concise statement with a New York City form which had different requirements for ordering additional work as differenti-



ated from extra work, the distinction not being stated and being such that there would be times when the average engineer or contractor would not know to which class the work belonged to. Result—the contractor would be refused payment for additional work done pursuant to extra work requirements or vice.

In this same regard why should a contractor, as is now frequently demanded, be responsible for unknown or underground conditions? Just lately in New York City a paving contractor found a lot of rock above grade which should have been taken out by a prior grading contractor. Under notice to bidders to examine the site, etc., the court of appeals held that the plans of the completed grading contract on file in the city offices did not constitute a representation to bidders of the condition of the road bed and hence the paving contractor had to do this work of grading without extra compensation.

Let us then have definite contract units of work at unit payments clearly specified, and provide payment for any other work necessary which may arise either at the unit prices or, as is becoming popular, upon a percentage basis. This latter method seems a fair means of providing for extra work as hereinbefore defined but the contract must specify exactly what is to be considered the "cost" upon which the percentage is based, as there is great difference of opinion on the subject. For example in one State, the statute provides for certain construction work at cost plus 15 per cent. There being no provision against subletting, the actual work was done by subcontractors at a fixed price. The "cost," as sustained by the highest court, included the cost to the contractor for the work as agreed and paid to the subcontractor, the contractor's overhead expenses for supervision, engineering, office rent, etc. In this way the State actually paid 53½ per cent on the actual cost of labor and materials at the job which is the popular conception of the word "cost" in percentage contracts. The rules of law applicable to percentage contracts are the same as those of the ordinary lump sum contracts. Under proper contract conditions with definite plans and specifications and with honest officials and contractors, contracts on the percentage basis of "cost of labor and materials at the job" would in my opinion give as wide scope for competitive bidding and should give better results in actual construction work. It should do away with many of the conflicts now common between the official, the engineer or both and the contractor. The tendency would also be to give closer competition between the large corporation with heavy overhead charges and the small concern with practically no such expenses. There would seem to be no question but what in the long run this would be less expensive to the municipality because it would tend to cut out the contracts with enormous profits and at the same time lessen the broken contracts because no contract should be given out for less than the defined "cost" price. This is merely a suggestion in passing but I should like to see it given a fair trial.

## DUTIES OF THE ENGINEER

Under most of our road construction contracts the engineer takes his time honored dual capacity of agent for the State or municipality and arbitrator between the contracting parties. It has been noted that if the contract provides that the engineer will make an estimate and issue a certificate he will often do so where he may refuse if such wording is not used. There is no question but what the engineer is given too much "discretion" under our present contracts. In road construction work there would seem to be no excuse for a lack of definite plans and specifications which of themselves should reduce the engineer's discretion to a minimum.

There always will be objections to the salaried or paid engineer of a State or municipality acting as an arbitrator without appeal as is the result accomplished by practically all State and municipal contracts. Upon the wording of such contracts some courts have even gone to the extent of holding the contractor but not the State or municipality bound by the engineer's decisions within the scope of his authority. Clearly such a result is unjust. In addition to this, State and municipal contracts are so replete with oppressive or "club" clauses for the engineer that a contractor knows he must take care of that official one way or another. It has been well said that no man should be placed in such a position where bribery and graft is often the easiest and cheapest solution of differences or disputes. Whether or not the engineer is an arbitrator depends upon the strict wording of the pertinent clauses of the contract. All such clauses will be strictly considered and no implied powers will be given the engineer. Where an engineer is made an arbitrator he must remember that he has greater powers than the judges on the bench, because he may intentionally decide contrary to the law and still have his judgment stand. On this account an engineer's decisions should be beyond reproach. The fact that in the exercise of his duties as arbitrator he cannot be held legally responsible for lack of skill, carelessness and even negligence should create an ambition to merit the honor bestowed. The engineer should never forget that he is, under present-day clauses, taking the place of the court and that his action may close the door to either party to appeal from his decision. Professional honor and reputation often depends more upon the engineer's action in such matters than upon his pure engineering knowledge. However, the engineer must know that he cannot ordinarily deprive the contractor of his right to judicial construction of the contract after it has been performed so far as such construction involves matters of law. These considerations show us that the engineer holds under our present day construction contracts an almost impossible position for a human being. Would it not be better to relieve him of some of these onerous duties? Experience seems to show that better feeling, better work, and coöperation between the engineer and contractor may be secured by more precise, concise and definite plans and specifications, and the elimination of all unnecessary "discretion" and "arbitration without appeal" clauses respecting the engineer.



## CONSTRUCTION OF CONTRACTS

Since we cannot expect any sudden change in present road construction contracts, this paper would not be complete without a statement of some of the most general legal principles which should govern the actions of officials and engineers even if the contractor cannot sue or get a fair hearing for his side. Since all State and municipal contracts emanate from the contracting official the ordinary rule is that the contract provisions should be construed most strongly against the author. Especially is that so when such construction is necessary to save a contractor from fraud and injustice, or where, as in these contracts, one party is at the mercy of the other. The following instances where municipalities have been held responsible in damages on account of the actions and orders of officials and engineers should be known and avoided:

a. Mistakes in lines, grades, elevations, plans or specifications or directions whereby the contractor had either to do additional work or do over work already done.

b. Requirement that the contractor do the work in a way not called for by the contract, entailing more expensive work than would customarily or otherwise be entailed.

c. Requirement that the contractor do over work already done properly or repair or maintain the same unreasonably.

d. Requirement that the contractor do work not within his contract as contract work.

e. Refusal to permit contractor to perform work called for by his contract.

A substantial performance of a contract creates a situation where the contractor is entitled to his full contract price less the expense of supplying the omissions and defects. From a study of cases all over the country the following rule would seem practical for contracts under \$25,000. Provided the contractor has honestly attempted to complete his contract, and particularly when he has followed the directions of the official or engineer, and when the omissions or defects do not pervade the whole work or make the object of the parties impossible or difficult of accomplishment, or when the usefulness or value of the construction is not materially impaired, and provided the cost or reasonable value of correcting such defects or omissions does not exceed 6 per cent of the contract price, then there has been a substantial performance. No practical working rule can be given for contracts over \$25,000. Substantial performance also excuses the production of an engineer's certificate.

In this connection it is important to note that in correcting defects, supplying omissions or completing a contract the State or municipality becomes bound by the terms of the contract and its plans and specifications. For example, if the contract permitted the use of native stone the State cannot use trap rock and expect to charge that against the contractor. In such instances a burden is imposed upon the official to complete the performance in good faith pursuant to all the contract provisions and with reasonable care and regard to

the rights of the contractor. There seems to be a tendency on the part of some officials to make an example of a contractor who has defaulted. Their chief object often seems to be to spend all the retains and if possible all they think they can collect on the contractor's bond. This is neither legal nor honest. The completion work must be done diligently, and the damages mitigated as much as possible. High-priced men cannot be used for cheap labor, nor can completion be delayed until market prices have risen. Thus it has even been held that a municipality was bound by the date of completion when it assumed a contract.

If a contract calls for liquidated damages for delay after a specified date, such damages are waived or are not recoverable by the State or municipality where they render the contract incapable of performance within the specified time or where they assume as agents of the contractor to complete the contract. Similarly if the delay after a specified date is caused, both by the State or municipality and the contractor, the liquidated damages cannot be apportioned. It has been held that a city cannot retain a substantial sum under the guise of liquidated damages for delay when in fact only nominal damages have been sustained. Where the liquidated damage clause falls, then actual damages caused by the contractor must be proved as an offset. There is still one very important matter pertinent in this respect. Where a contractor follows detailed plans and specifications and the directions of the engineer and completes any part or all the work there should be no deductions for variations from the contract since the parties have practically construed the contract as one for work in accordance with the engineer's directions and such construction must prevail over the literal meaning of the contract. Also under these same conditions and circumstances a contractor is not responsible for a result nor is he responsible for any defects or repairs (except where there is a repair clause) beyond those required by the failure of the contractor's materials or by the contractor's own work. In other words, a road contractor usually does not warrant the road as capable of standing any particular traffic, etc., that should be determined by the plans and specifications.

Naturally the most important thing to the contractor is prompt payment, not only of his partial but also of his final payment. It is a general rule of law that a failure of a State or municipality to pay an instalment on the due date causes a breach of contract which relieves the contractor from further performance and enables him to collect the contract price or reasonable value of all work done to date. The failure of the engineer to make his estimate and issue his certificate may not excuse a failure to pay partial payments even if they are required to be made only upon engineer's certificates. The refusal of an engineer, under ordinary circumstances where there has been work done, to make his estimate and issue his certificate in time so that the contract payment can be made is of itself presumptively fraudulent. Again it is often found to be the case that the



engineer refuses to act upon the direction of the official, which, of course, is collusion, and which excuses the production of such certificate. It is a rule of law that an engineer's certificate will not be considered as a condition precedent to a partial or final payment unless it is definitely and distinctly stated so to be in the contract. The control of the money bag is often supreme and in this way engineers and officials have it in their power to make or break a contractor. A reputation of an engineer for prompt and fair estimates and of an official for prompt payments is sure to result in lower bids and better construction work.

Having considered these few most important matters and with an understanding of the legal principles involved cannot we in the future have justice and equity and not vengeance, spite or bossism in road construction work? The result of such a change, where it is necessary, cannot but be beneficial to all concerned.

#### REPAIRS

There seems to be a tendency in some of the present day road contracts to require a contractor to maintain the road for a specified length of time, usually one to five years. Is that a good and economical requirement? Does it not to a certain extent restrict bidding and contracting to local parties? Are not the unit prices and hence the contract total largely increased to take care of an unknown amount of repairs? Is there not a gamble on that matter? The best of roads require constant inspection and repairing to keep them in shape. That work should be done either under a strictly repair contract or by the State or municipality itself. This criticism of course is more applicable to country roads as differentiated from city streets.

#### SUMMARY

In a late article of mine advising architects respecting employment by State or municipalities the following rules were formulated which would seem pertinent here:

1. Know that the municipal corporation is acting pursuant to the law creating it.
2. Know that your contract does not cause the indebtedness of the municipality to exceed its constitutional or statutory limit.
3. Know that your contract does not exceed a limit above which advertisement and acceptance of the lowest bidder is required or that proper advertising, awarding, etc., has been done.
4. Know that assessments or taxes to pay for public improvement work which include your compensation are valid.
5. Know that the board or official employing you do so in the proper legal method required by the act incorporating the body or by the charter or by the local rules governing such body.
6. Know that funds are available or a specific appropriation made by the proper authorities to pay you before proceeding with your contract work.

7. Have your contract in writing and know that it is worded properly.

8. Have and put everything in writing and act only upon the strict wording of all contracts.

9. In State work ascertain first if there is a State board or court of claims; if not you must depend on the official honesty and integrity of the official with whom you deal. Remember personal honesty and official honesty are contradictions in some officials.

10. Never consider or do any public work without first consulting competent legal advice.

While the above advice for the contractor will give him some knowledge of his position in a road contract, yet it does not protect him from the many abuses now possible under such contracts. Those must be corrected by honest, conscientious officials who will countenance only the same character of engineers. Contracts and general specification conditions for road work must be drawn solely for that class of work and not copied slavishly from ancient documents used for buildings, etc. There must be no discrepancy between the contract clauses and the general conditions or other parts of the specifications. Unit prices for unit quantities of specified work with full details in the plans and specifications or cost plus percentage contracts for definite work with opportunities for honest, competitive bidding and awards to lowest bidders are essential. All unnecessary "satisfaction," "discretion," "warranty," "final and conclusive decision," "waiver of damages," "waiver of claims," "waiver of right of action," etc., clauses and other similar oppressive or "club" clauses for the official and engineer must be eliminated. They certainly are anything but a sanction for the expectation of good faith in the mutual dealings of men of average right-mindedness. Lastly and most important the agreement between the parties must be made a real contract by giving the contractor the power to assert and prove his claims before a competent court or board.

**THE CHAIRMAN:** The discussion of Mr. Bowman's paper will begin by presenting a paper by Mr. James A. Head, who was formerly mayor of Nashville, Tennessee. I regret to say that Mr. Head, on account of illness, was unable to attend, but we are fortunate in having the paper read by Mr. Kenyon, president of the highway commission of Indiana. Mr. Kenyon.

**MR. KENYON:** Mr. Head sent me a telegram and asked me if I would read this paper for him, which was a little discussion of some of the legal problems that arise in these matters, and as an addenda to the very excellent discussion you have just listened to.



## MUNICIPAL CONTRACT LAW AS APPLIED TO ROAD CONSTRUCTION

BY JAMES M. HEAD

*Ex-Mayor of Nashville, Tennessee*

The building of good roads by the federal government, by the several States and by counties and cities is fast becoming, if it is not already the topic of chief interest to the great mass of the American people. The general law upon this subject is growing, expanding and developing to meet the conditions with which it is rapidly being confronted.

The *Law Merchant* of the common law (which is nothing more than the usages and customs of business reduced to practice soon to be enacted into statute law as the highest expression of public sentiment the real court of last resort as to all law) is fast forcing intelligent action upon this most important subject.

Originally it was thought to be and doubtless was sufficient to meet the conditions then existing to "summons" or "warm in" the neighbors on each road to appear on a given day and devote a specified time to "working the roads." As cities multiplied and developed, this primitive method (which I am sorry to say is still in force in some sections of the country) was found to be wholly inadequate to meet these conditions, and the principal streets of the several towns had to be improved out of the general funds raised by taxation. The growth of towns became so rapid that enterprising individuals soon found that improved streets, sewers, gas and water privileges not only enhanced the general value of property in the towns but actually increased the market value of the property adjacent to the improvement so that the policy of making local assessments against the abutting property to cover a portion or all of the expenses for making the improvements has come to be one of the recognized and established policies of modern law as applied to city improvements, and is now in some sections seriously being considered as properly applicable to country road construction.

This growth of the law and the changes which have taken place within the past few years have necessarily resulted in more or less serious trouble with legislatures, and have produced complicated legal controversies, resulting in more or less serious difficulties both to the contractor and abutting property owners.

Assuming that the broad position is well established, both in law and in public opinion, that abutting property owners may legally be assessed to pay for public improvements at least to the extent of the benefits actually received by reason of the improvement, the law applicable to such proceedings, the method of procedure, and the rights and obligations of the contractor and property owner respectively are still in a more or less unsettled condition in some

places, different policies being pursued in different sections of the country.

The first tendency of the courts was to hold all statutes prescribing the method to be pursued to render abutting property liable for special or local assessments to be in derogation of the common law principle of the equality of taxation, that all such statutes must be strictly construed, and that the liability of property owner for this tax (if such it may be called) was to be set aside unless the exact method pointed out by the statute had been strictly complied with. While this strict construction policy has been practically abandoned and all such statutes are now given by the courts, if not a liberal at least a reasonably fair interpretation, we are still often confronted with the most unexpected interpretations of such statutes.

It is to be hoped that we will soon have no more decisions relieving abutting property owners from all liability for their assessments because as in one case the publication required by the statute that notice of the proposed improvement should be published for so many weeks prior to advertisement for bids and that the requisite number of days had not elapsed by one or two days; or, in another case where the notice required that the advertisement should be made at each end of the proposed work in letters two inches large, whereas the notice as actually published was made with letters only  $1\frac{1}{2}$  inches large; or in a more recent case where the ordinance described the property proposed to be assessed as being situated in lot C, when in fact it was actually situated in lot 6.

Such decisions only illustrate the importance of having not only the ordinance of intention to improve, the advertisement, the ordinance making the improvement, and the contract itself to follow both the letters and spirit of the local assessment statute and thereby avoid all possible litigation of this character, resulting either in defeating the collection of the amount due the contractor altogether, or else in casting the entire burden of making the improvement upon the city at large.

The occasional practice of dishonest public officials in awarding contracts for such improvements to favored contractors at exorbitant prices, sometimes shared in by the officials themselves, has led the courts and legislatures to look for some remedy to prevent such flagrant abuses of power and thus no doubt has often resulted in the strained and unnatural construction to which such statutes have been subjected. It was naturally assumed and is still believed by many that competitive bidding in the letting of all public contracts would automatically prevent this corrupt abuse of power, and hence the construction that anything which tended to interfere or which could be construed as interfering with the freest and fullest competition must be held illegal and as expressly prohibited by the statute requiring competitive bidding. It was of course self-evident that the adoption of plans and specifications calling for one kind of improvement, where there were several different kinds that would



answer the same general purpose, necessarily resulted in the restriction or limitation of bidding to those bidders who could or who were prepared to furnish the particular kind of improvement specified. As the adoption of some plans and specifications were absolutely necessary before a public improvement could be advertised for or let by public contract, it was at first assumed that patented or monopolized articles could not be purchased at all by public officials where contracts were to be let to the lowest bidder after advertisement. But this narrow and restricted construction of the statute, which necessarily resulted in prohibiting the use of what might be the very best and cheapest for the purpose desired, has given way to the now generally recognized doctrine of the right of public officials to specify patented or monopolized articles where a reasonable price at which any contractor may purchase the monopolized article is given and no allegation or proof of actual fraud is made. It is in fact being recognized that because so called competitive bidding can be and often is evaded, municipalities should not be deprived by law of the right to use the best that can be had, whether monopolized or not, and that the selection of honest, competent and efficient public officials is at last the only sure way to prevent collusion and fraud. With honest officials capable of forming an intelligent opinion of what is needed and what is best, and the adoption of definite specifications required to be lived up to, satisfactory results always can be attained whether or not monopolized article be used.

The doctrine laid down by some of the courts that the specific method prescribed by the statute for making local assessments must not only be literally followed, but is at the same time the measure of authority to make the improvement at all, is fast becoming obsolete, and the far more reasonable doctrine is now generally accepted that patented or monopolized articles may be specified if an opportunity for competitive bidding is provided whether actually taken advantage of or not.

The duty of municipalities to maintain their streets in a safe passable condition for the benefit of the public, and their right to make local improvements and charge a part or all the costs thereof against abutting property owners at least to the extent that such property is actually benefited, being generally acknowledged the duty of the several counties and States to open and maintain for the use of the public free of charge public highways between the several prominent points in the State, and the right of the federal government "to establish post offices and post roads" for the convenience of the general public being generally conceded, the best method of accomplishing these several results becomes at once a matter of the greatest importance and about which no mistakes should be made.

To what extent these several jurisdictions should act in concert in raising and using public funds to accomplish the desired object is a question about which at this time there is great diversity of

opinion. In regard to cities, it is now generally considered that it is their right and duty to open and maintain streets in their proper condition for the free use of the public and if necessary or advisable charge a part or all the cost of construction and maintenance to the property especially benefited. As to towns and villages through which county or State highways must necessarily pass in reaching large points of general interest, other and more complicated questions necessarily arise as to how such improvements shall be made, how paid for, what material shall be used and how maintained after the original cost of construction is provided.

As to the proposed establishment of "post roads," even more and greater difficulties naturally arise, not only as to the right to use public funds for such a purpose at all, but also as to how these funds are to be raised and how utilized.

In view of the fact that the cities have generally acquiesced in this duty of constructing and maintaining their streets in a reasonably safe condition for the use of the public, and have secured suitable laws and ordinances in most cases for this purpose, in view of the fact that most of the States and counties have already taken steps looking to the establishment of highway laws suitable to the peculiar conditions which each locality must be confronted, is it not the part of wisdom if not of necessity for the federal government under its specific grant of power "to establish post offices and post roads" to formally adopt certain highways as "post roads" and if need be pay the several States or counties through which the "post roads" may pass the fair and reasonable value of present improvements of such roads, thereby enabling the State or county to build additional roads; and as fast as possible not only "establish" but maintain all such "post roads" independently of any State or county regulation or control? If such a system should be adopted, although it might be difficult to start at first, like the rural free delivery mail system, it would soon adapt itself to the necessities of the case, and would become practicable and workable, and we would soon have federal, State, county, village or district road systems applicable not only to the whole country, but adapted to the local conditions of each community through which the several roads may pass.

The raising of separate funds for the original construction and continued maintenance of the different systems of roads, the determination of the kind and character of road to be built, the location and maintenance of the road are all questions which must be left to the several federal, State, county and district or local organizations respectively if satisfactory results are ever to be accomplished. The dividing of authority and responsibility, or the lending of financial aid to be used by local organizations cannot result in satisfactory road construction, which to be successful must have a well organized official head vested with authority to act, and means to be used in accomplishing the desired results.



These are the ends to which all road organizations should contribute. National highways over the most direct route between the principal cities and State capitals to be constructed and maintained by the general government; State highways over the most direct route between the leading towns of the State to be constructed and maintained by State funds managed by State officials and possibly constructed by convict labor; and county or district roads as feeders to these several national and State highways to be constructed and maintained by neighborhood contribution and local officials.

THE CHAIRMAN: The papers are now open for further discussion. Mr. Bregenzer, editor of *The Contractor*, of Chicago, has kindly consented to make a few remarks on the subject.

MR. BREGENZER: The legal considerations brought up by a former speaker, Mr. Bowman, bring up a point very near to the contractor in signing road contracts, and the most important of these is probably the maintenance bond. The maintenance bond militates not only against the contractor in holding up his payments, but in a measure it militates against the manufacturer of good, honest road material. The maintenance bond requires that a certain sum of the amount to be paid the contractor, shall be withheld until the authorities be personally or otherwise satisfied that a road will stand up for a given period. Now in making an analysis, you will find that in the first place the road material is specified by the engineer; the methods of construction are largely specified by the engineer and the materials and methods are supervised by the engineer's inspector. In spite of this, the burden is placed upon the contractor to pay if it does not stand up. I think that is particularly pertinent in reference to the material that is used in the roads.

Another subject of importance that would require a little unification on the part of the contractors in getting some justice would be from the standpoint of bids. A very peculiar thing happened last month in the State of Illinois. About six bids were to be let. They were advertised for, but there were no bidders. On inquiring into the reason we found out that in every case the estimate was so low that the contractor was unable to bid on this work. I think it would be a very good point if contractors would unify on subjects of this kind, so that the standards and costs of doing work would be recognized by the engineers as well as the contractor. Until they are able to accomplish this, the same condition will always prevail, and I think that would be one of the important recommendations to be made in this case. Thank you.

THE CHAIRMAN: Is there any further discussion. If not, we will proceed with the consideration of the next paper, "The Protection and Upkeep of Road Equipment," by Mr. Daniel J. Hauer.

## THE PROTECTION AND UPKEEP OF ROAD EQUIPMENT

BY DANIEL J. HAUER

*Construction Economist and Consulting Engineer*

No matter whether roads are built by contractors or by day labor forces under the direction of engineers, the item of plant and equipment is one of the prominent factors of cost. Inadequate plant means to materially increase the cost of construction. Only recently the writer stood watching some road building upon which only a few tools were being used, and most of them were ill-adapted to the work. It was difficult to accurately calculate the exact amount of money that was wasted, due to a lack of road equipment, but it was easily estimated that the cost of construction was increased at least 25 per cent. Likewise, too much plant can make an added cost. Even with the proper plant, and handled in an efficient manner, the plant item in road construction is a larger per cent of the total cost of the work than in most other classes of construction. This is due to two causes. First, the plant necessary to build a wagon road is much more expensive than that to build, to illustrate we will say, a railroad. With light grading on both, the same equipment will be needed to do the excavation. For the railroad a small concrete mixer may be needed, and some track-laying tools to complete the job. On the other hand, for the wagon road there will be much hauling of road materials, thus wagons and a traction engine will be needed, then road scrapers or graders, and spreading machines, water sprinklers, oil sprinklers, and heating apparatus will be necessary; scarifiers, harrows and rollers must be used, while for concrete culverts and bridges, mixers, derricks, buckets, barrows, and other appliances are called for to do the job in an efficient manner. The writer has constructed a section of a railroad costing about \$100,000, with a plant costing only about \$5000, while a contract for less than \$50,000 of wagon road took an outfit costing nearly \$20,000; 40 per cent of the total cost instead of 5 per cent.

The second reason for the larger cost of plant for wagon road construction is that this class of work is let out in small scattered contracts that are uneconomical from a constructive standpoint. The reason, too, for road building in nearly every section of the country is short.

Naturally the life of any machine is dependent upon the use and care given it. The longer the life, the less the annual depreciation, consequently some of the high plant cost can be eliminated from road construction by the proper care and upkeep of the equipment, and by selecting the most improved and economical types.

As far as possible the same machines should be used for many different purposes. This can be done in two ways: By trying out machines designed for one particular kind of work, for other kinds,



and by adding attachments to machines that thus adapt them to three or four different things.

To illustrate, a contractor once found by experimenting that a certain kind of road grader would spread crushed stone for macadam at a very much less cost than it could be done by any other known method at that time. Then a road roller that can be used as a traction engine, with a scarifier attachment, and likewise for operating a stone crusher, or other machines, can be said to be four tools in one; not that it is possible to use it for more than one purpose at a time but in the present method of building roads a roller is only used a small portion of the time, so it is economical to adapt it to as many uses as possible. In this manner the cost of plant, or rather the investment in plant can be maintained at the minimum.

In like manner, wagons, which are an important factor in road building, should be of the most improved type, and adapted as far as possible to all kinds of hauling. So, too, with concrete mixers. Some contracts demand a hot mixer as well as one for mixing ordinary concrete. Money is saved when one mixer will answer for both purposes.

Another item in the cost of plant is in the character of the plant purchased. Cheap and poorly made plant means money lost to the contractor in several ways. Delays occur through breakdowns and these are always expensive. Cheaply made tools mean continual repairs and a short life, and are an added expense to any job. Only well-made tools should be used. A guarantee as to the construction of a machine can and does mean little. It does not mean payment for delays caused by breakdowns, nor for poor work being done. The ability of a manufacturer for swearing his product is a good one is not a help to a contractor or engineer in getting his work done, nor in showing that the machine in question is well built. The greatest asset is in buying from a firm of recognized responsibility, one of integrity, and one that is so well advertised that they must stand behind their products by putting into them only the best of materials and workmanship. This is the best guarantee possible. This means work done at a low cost. A firm with such a reputation means that thousands of dollars have been spent by them and their customers in obtaining these results. The new customer profits from these past expenditures.

These are all possible factors in plant and equipment, upkeep and maintenance cost. The problem that the contractor and construction engineer must solve in this connection is a very difficult one, owing to the many adverse conditions.

Road work is done in comparatively short stretches, usually in a single season, which varies in length from about one hundred, to one hundred and eighty days, according to the climatic conditions. A contractor's plant is moved onto a job, and is used along the line of the work, part or all of the time during the season. Much of a contractor's plant is made up of transportation machinery, and even

other items of plant are only working in one place for a few days at a time, so that to protect plant while at work on such jobs is very difficult, and in many cases any kind of a protection is a detriment, and a great hindrance to the free movement of the men and teams.

All machinery should be protected when it is not being used, and some when in use. Boilers at work use much more fuel when not protected. Some kind of a house, built in sections should always be used to protect boilers. Such sheds can have one side left out, and a canvas curtain used when necessary. If the sides and tops are built in sections they can be hooked together with hooks and rods and staples so as to be rigid enough to stand up against the wind and weather.

Machinery that cannot be protected while at work, can be covered with canvas coverings over night, during rainy spells and at such times when they are not in use. Every traction engine and roller should be thus protected. Steam drills and such tools can be covered with a canvas jacket. The machinery part of a concrete mixer can be so protected, and also pumps and other equipment. Heavy water-proofed canvas will be found to be excellent for this purpose, and not only keep the machinery clean from dust and mud, but will likewise prolong the life of the equipment. As the canvas becomes worn from use, it must be retreated with water-proofing liquids to preserve it.

At the end of the season, with the job finished, the question always arises, "What shall be done with the plant?" To move it from its present place to some central storage point, will mean an added expense to get it onto a new job. If the work on the same road is to be continued the next season the entire outfit may have to be moved back. The plant can be moved to the next job at the minimum cost from the site upon which it last worked. Then the question comes as to how repairs should be made, and the protection to be given the plant from the winter weather.

Situated away from machine shops, the proper overhauling cannot be given to all the plant, but it will be possible to replace many of the worn and broken parts with new ones, tighten up all loose keys and nuts, true up all bearings, and do all repairing that can be done in the open. Then all iron and wood work can be painted. This is a protection not only against the weather, prolonging the life of the plant, but is also a business proposition that pays well, as everyone is impressed with machinery that looks well, and paint covers a multitude of defects.

In some localities it is possible to obtain an empty warehouse or barn in which the various machines can be stored while they are idle, or during the winter season. This keeps them entirely out of the weather, and also allows of repairs being made under cover, which means not only quicker, but also cheaper work.

For winter storage it is also possible to group a number of machines together, and build over and around them a temporary shelter made



of cheap boards and single ply tar paper, which will last during a winter season. By using the tar paper, the boards can be spread 6 inches or more apart, both on the sides and roof. Around this temporary shed a ditch should be dug so as to prevent surface water from getting to the machines.

If it is not possible to protect the machines by any of these methods, then the canvas coverings can be resorted to, with fairly good results. These covers should, as far as possible, be shaped to the machine upon which they are to be used. Good and substantial brass eyelets should be fastened in the well-bound edges, so that the coverings can be tied tightly to or under the machines, otherwise the wind will flap them loose, soon beating the covering into shreds, as a flag is worn out by the wind, and thus exposing the machine to the weather. Canvas coverings made to fit any machine will always be found useful in protecting machines over night or when not in use for a few days.

Whenever machines are not stored for the winter in buildings, they should be stripped of their brass and glass parts, otherwise these fixtures will be broken or stolen, which means a serious loss. The parts from each machine should be placed in a separate box, nailed up, and properly labeled, the box being stored away for safe keeping. If the machines are stored in a building, it is not necessary to take off parts, as if anyone breaks into the building they must go to the trouble of taking off the brass, while if the parts are stored in boxes, the rascals take box and all, giving them much less trouble, and thus assisting them in making a clean sweep of all the brass fixtures.

When a new machine is purchased, there should always be bought at the same time a number of spare parts, which should be kept on hand to be used as needed. No man can build a machine that will not break down in some vital part sooner or later. A breakdown in a construction job means not only a delay, but a waste of money, for even if men can be laid off and not paid, or can be given other work, yet the job due to the changes made necessary by the breakdown, will not be worked in the most economical manner. It is true that many contractors do keep some spare parts, but they seldom have on hand enough, or the proper ones, due to the fact that as the parts are used to replace broken ones, new ones are not ordered from the factory. Then either one of two things occurs: the job is shut down or some part of it, or the machine is worked with the broken part until a new one can be ordered and put in place. This means that the machine is racked by the work it does, doing permanent injury to it.

A good blacksmith shop on the job, equipped with forge and heating heavy steel and with stocks and dies for bolts and pipe, and with good drills and vises, will be found to be a great assistance in the upkeep of road equipment. For heavy machines a few roller bearing or small hydraulic jacks will be found useful in making repairs and renewals.

Small tools can be repaired promptly in a blacksmith shop. Attention should be given to these as well as to the larger machines. To prevent such tools being lost, they should not only be branded with a die of the contractor's name or initials, but they should likewise be painted with a set of colors, selected by the contractor, to designate his equipment and advertise his business. These colors can be used on the head of some tools, and in most cases on the handles. Tools can thus be seen at some distance, and thus prevent their being stolen or lost. All bright parts of tools and machines that can't be painted should be well greased so as to prevent rusting.

Many of these suggestions seem useless, or more or less self-evident, but anyone who has much to do with road construction knows that tools and machines are scattered along the entire line of a piece of new road construction, just where they were last used, and there they stay, neglected, until they are needed again. Then they are found out of order, and to repair them frequently new parts must be ordered, some days intervening before such parts arrive. The tool or machine depreciates greatly in value by such treatment, and thus contractors are compelled to figure a heavy plant expense item against every job. The cost of caring for this equipment is much less than the depreciation figured against it from neglect.

Such extra costs mean higher prices for road work, and as there are many thousand miles of roads that need improving, every dollar wasted means less mileage built each year. Both engineers and contractors are interested in obtaining good roads, and they should do everything possible to save money in the construction of roads.

**THE CHAIRMAN:** If there is no further business before this meeting, this session will be adjourned and the finance session will be called to order. Mr. Gash, president of the Illinois State highway commission, will take the chair.



## FINANCE SESSION

UNDER AUSPICES OF SPECIAL COMMITTEE OF AMERICAN BANKERS  
ASSOCIATION

THE CHAIRMAN: It was not intended that I should preside at any time during the sessions of this Congress, but Mr. William G. Edens, president of the Illinois Highway Improvement Association, is unavoidably absent. His paper on "Financing Road Improvement," will be read.

### FINANCING ROAD IMPROVEMENT

BY WILLIAM G. EDENS

*President, Illinois Highway Improvement Association  
Chicago, Ill.*

The attention of our people has so recently been turned to the improvement of country roads that the judgment of competent engineers is not yet definite as to the best types of road to be constructed, particularly in the sections where different soils and climatic conditions prevail and where experiments must be made before it can be determined just what types of road it is best to construct.

The matter of financing road improvement, therefore, becomes an important one, for in the middle west particularly and in portions of the country where the population is sparse, the funds available for taxation, especially with respect to bond issues, are not so large as in the older eastern sections of the country and the correct financing of road improvement is a serious and important public question. The people of these sections are perfectly willing to improve the roads but do not care to pay for extravagant experiments which have been tried out in older sections of the country and in Europe and which, owing to changing traffic conditions, have been found to be failures.

I shall not attempt in these brief remarks to cover the bond issue feature of the subject as there are a number of gentlemen on the program at this session who will deal with this phase of the problem. As a result of my travel and experience, however, I feel impelled to say that the western country will insist on a thorough investigation as to the best types of road, their cost of construction and maintenance and a non-partisan, economical expenditure of the money available for road improvement. Our experience in the wasteful expenditure of money under the old Elizabethan system in vogue in many of the States, where a large number of highway commissioners work independently of each other, poorly paid and largely inexperienced and

with inadequate funds, shows that this whole matter, to be successful, must be placed on a business basis.

In Illinois the opposition of the land-owning classes to the campaign for better roads was founded on the belief that the increased taxation for the building of better roads would fall entirely upon the abutting land owners; hence, the Tice bill recently passed by our legislature was drawn on the theory that money derived from automobile licenses supplemented by appropriations from the general treasury raised through general taxation should be used for this purpose. By this means it is estimated that only 27½ per cent falls on the land-owning classes, the remainder coming from corporation taxes and those of the residents of the cities, towns and villages.

Senator Bourne has suggested a novel plan for financing road improvement. Under his system it is proposed to create a fund to be known as the United States highway fund to be raised principally through the issue upon a pro rata allotment basis, at not less than par, of government bonds of denominations of \$20 or multiples thereof; said bonds to be payable fifty years from the date of issue and to bear interest at the rate of 3 per cent, the total issue not to exceed a billion dollars. Each State before being permitted to share in the distribution of this money is obliged to create by law a State highway commission having general supervision of road construction and improvement.

It is a debatable question whether or not the national government should engage in such a system of road financing as that advocated by Senator Bourne and it should be decided only after careful thought and consideration and further investigation. The recent action of Congress in creating a committee on roads in the House would indicate that this matter is to be carefully considered. To this committee will be referred all of the information and recommendations of the select committee of which Senator Bourne is chairman. Certain it is that no funds should be available on the part of the national government for the improvement of roads in the various States until the States themselves comply with the provisions of such national legislation and the law should be of such a character as would prevent individuals from canvassing or campaigning for nomination or re-nomination to public office on the theory that their subsequent election would result in their securing public funds for the construction of roads. We must educate the people who live upon and use the roads as to the benefits to be derived from the construction and maintenance of an up-to-date system of highways and impress upon the road users that the matter of improving the highways is an important part of their duty as good citizens.

The imperative necessity for good roads has become so generally recognized that organized effort is being made to establish a modern system of highways. It is realized that the matter vitally affects our economic welfare and thus merits thoughtful and earnest consideration. In bringing about an accomplishment of this reform we



ought to recognize the fact that the drainage and the care of the earth roads, a large mileage of which will remain in each agricultural state after the principal roads are improved, are to be included in the program. Rural members of the legislature will not continue to vote state aid if the lateral roads, which must naturally remain of the earth variety, are not improved by drainage and dragging and a systematic plan developed whereby these roads are made fairly usable the year round by organizing a force of practical road-builders and care-takers to give them the proper attention.

In our investigation we, in Illinois, found that the money of the taxpayers was being wasted and that of the \$7,000,000 expended annually, 37½ per cent was being spent without any appreciable benefit, and in some counties even more. We have proceeded on the theory that effective work can be accomplished in the matter of road improvement by a system of state and county coöperation in the construction and maintenance of main highways and bridges and so our bill provides for a non-political state highway commission, the members devoting all their time to their duties.

The value of the use of convict labor in the preparation of material for road building and in actual work on the roads is beginning to be recognized more generally than heretofore. In Colorado, which I visited last year, such a plan is followed and the results obtained have been highly satisfactory and are such as would reflect creditably to any State. Warden Tynan of the State penitentiary at Canyon City told me that of the 800 inmates of the prison more than 400 were located in various camps throughout the State engaged in road building, and that statistics showed that 80 per cent of those paroled or released return to useful occupations and make good in their efforts to be restored to citizenship. During the winter months the prisoners are engaged in the preparation of road materials and in the summer months engaged in the actual road construction. This is a system of road construction which any State might profitably adopt. There is great benefit, not only to the State, but to the convict as well, for he is enabled to be employed at outdoor work, which has a tendency to keep him in good health, and after his term of servitude has expired he is the better prepared to resume his place in society.

Since the passage of the Tice bill by the Illinois legislature and which became effective July 1, the warden of the Joliet, Illinois State prison has organized a group of road workers from among the Illinois prisoners and the experiment is now being tried out in our state under the honor system. We believe it will prove to be successful and will be one of the agencies to bring about a reform in prison management so greatly needed as well as an aid in developing a system of improved county roads.

## BOND ISSUES FOR ROAD IMPROVEMENT

BY S. E. BRADT

*Member Illinois State Highway Department*

The importance of road financing has always been recognized, but the underlying principles have been but little discussed. I shall endeavor to present some of the reasons for resorting to the issue of bonds in paying for road improvement, and the conditions precedent thereto.

I am going to assume that, inasmuch as our highways belong to the public, and that the condition of these highways has a very important bearing upon the economic, social, educational and religious advancement of our entire citizenship, it therefore becomes the duty of the people through the public revenue to provide for their improvement and maintenance.

The question arises whether the money for this improvement shall be provided by an immediate tax levy, or by the issuance of bonds, and if bonds are to be issued what would be the conditions requiring this method. Good public policy demands that we should not resort to borrowing money in public affairs:

1. Unless there is urgent need for the improvement.
2. Unless the improvement is of such a magnitude as to prevent its being paid for through the regular course of taxation.
3. Unless the improvement shall be of sufficient permanency as to give full value to those who shall be called upon to repay the indebtedness.

Let us consider these three topics in their order:

1. The urgent need for the improvement. The question that confronts the world today is the same that has confronted it during all the past and will undoubtedly become more acute in the time to come, viz: the food problem. This problem is so large that every fraction taken from the cost of production or the cost of transportation means a saving of millions to the people. While railroad rates have been reduced from  $7\frac{1}{2}$  cents per ton mile in 1837 to 7.8 mills per ton mile in 1905, a reduction of nearly 90 per cent; practically no reduction has been effected in the cost of highway transportation. The office of public roads has estimated the total cost of hauling to the shipping point that part of our agricultural, forest, and miscellaneous products, which we market, to be in excess of \$500,000,000 annually. This does not take into account the cost of hauling from the different markets to the farm, or from farm to farm. The office further estimates that by the proper improvement of our highways this cost of hauling can be reduced over 50 per cent, thus effecting a saving of \$250,000,000 annually.

Again, the census figures offer some valuable material showing the need for highway improvement. These figures show that in 1890 36 per cent of the people of this country lived in cities. In 1900



40 per cent and in 1910—46 per cent, an increase of 10 per cent in city population as compared with rural population in twenty years; thus by this movement our food producing population is been depleted to an alarming extent. This question of the movement from the farm to the city cannot be solved until our highways are improved. Likewise the development of country social life, school life, and religious welfare, are waiting on the improvement of our roads. These needs are far greater than the economic, but they are not so tangible and hence do not appeal so readily to the people.

This urgent need for roads is further indicated by the insistent demand of the people for the improvement of our highways. The evidence of this comes from many sources, of which I wish to mention a few. As one of the evidences of the public demand, I want to call your attention to the State of Missouri where 300,000 citizens worked for two days with pick and shovel, with wagon, grader and drag, filling holes, building pikes, rounding up roads, equalling 600,000 days' work donated by the people, who are insisting upon roads that are usable. This is one of the greatest demonstrations of recent years, but it is only the forerunner of what we shall see later on. Within a very short time these 300,000 people will be demanding that instead of the continual repairing of dirt roads the State of Missouri shall inaugurate a system of road improvement along more permanent lines and that their work and their money shall be contributed to work that will endure.

Another evidence of the demand for good roads is found in the rapidly increasing number of good roads associations, international, national, State, county and city. We have numerous national associations, nearly every State has a State association. In some States each county has an association, and no city is too small to boast of a good roads or automobile club. Not only that, but most of the commercial organizations, the woman's clubs, the farmers organizations, the bankers associations, have active good roads committees doing effective work for the cause.

We again see the evidence of this demand in the attitude of the press of the country. No great public improvement during this generation has received such unanimous approval from the press as has this good roads movement. You can scarcely pick up a paper, whether a country weekly or a city daily, that does not contain some favorable mention of the project.

This urgent demand is again very forcibly shown by the fact that during the sessions of the sixty-second Congress forty-seven bills were introduced looking toward the assistance by the national government in highway improvement. This surely indicates that it is only necessary for the friends of good roads in Congress to get together on some broad and equitable national policy in order to give the movement the national aid to which it is entitled.

This resume would not be complete if I failed to mention the greatest factor in this urgent demand for good roads, viz., the motor driven

vehicle. Without doubt we at some time in the future would have had good roads even though the automobile had never been invented, but the coming of the automobile will give us good roads twenty-five, perhaps fifty, years sooner than they would have come by reason of all of the other forces combined. Perhaps the increase in the use of the automobile in the rural districts can best be illustrated by the traffic census taken under the auspices of A. N. Johnson, State engineer of Illinois, at a point on the Central Transcontinental Highway just west of De Kalb, Ill. This census was taken first during six months of 1907, next during August and September, 1912, and again during August and September, 1913. In 1907 the motor driven traffic was 5 per cent of the total traffic. In 1912 (five years later) the motor traffic was 50 per cent of the total. While in 1913 the motor traffic was 60 per cent, thus showing a total increase from 5 per cent in 1907 to 60 per cent in 1913.

Another illustration that came under my own observation was at the annual meeting of the De Kalb County Soil Improvement Association. This meeting was held at a point three miles distant from De Kalb, Ill. The attendance was estimated at 1100. Of this number at least 90 per cent were farmers actually living on farms or operating farms. By actual count there were on the ground 26 horse drawn vehicles, consisting of 18 single buggies and 8 double buggies, as compared with 109 5- and 7-passenger automobiles. Thus it will be seen that not over 75 persons of this company of 1100 farmers came in buggies, while approximately 600 came in automobiles, the remainder coming by trolley. You have heard, even quite recently, that the good roads movement was in the interest of the leisure class of the cities and the pleasure seekers, and that the farmer was opposed to the movement, because only the residents of the city received the benefit. I bring this illustration to show that the time is near at hand when the farmers in proportion to their number will own more motor driven vehicles than the residents of the cities.

I believe, gentlemen, that the foregoing is sufficient evidence of the urgent and immediate need of better roads.

2. Let us now look into the magnitude of the project. In order to determine whether this enterprise is too large to be paid for from the ordinary revenue, we must ascertain the amount required, and what particular taxing bodies should stand the expense. The amount required will depend upon the number of miles we expect to improve, the character of the construction to be used, including width, etc. We have in the United States, according to the office of public roads, approximately 2,200,000 miles of country highways. This office has ascertained by investigation that 15 to 20 per cent of our main highways carries from 80 to 90 per cent of the total traffic; further that 15 to 20 per cent of our highways carries approximately 60 per cent of all farm traffic. This mileage of 20 per cent will be sufficient to cross most of the States both north and south and east and west every six miles, and will include all of the main market roads, inter-county,



interstate and transcontinental highways. Fifteen to twenty per cent of this 2,200,000 miles would be approximately 400,000 miles. It is estimated that 11 per cent of our roads are already improved. This, however, includes all classes of improved roads, such as gravel, the various types of macadams, brick and concrete. It is probable that less than 5 per cent (not exceeding 100,000 miles) are so improved that they will give a wear of over ten years, even the well maintained. We therefore believe that the mileage yet to be improved is not less than 300,000 miles.

Let us divide this 300,000 miles into two classes, viz: the roads connecting all State capitals and larger cities, comprising approximately 50,000 miles; and the main market roads connecting the county seats, cities and villages of the different states, comprising approximately 250,000 miles. The first 50,000 miles above referred to, being the main traveled roads, should be 18 to 20 feet in width. The roads connecting the smaller centers of population, such as county seats, could vary in width from 12 to 16 feet, depending upon the probable traffic.

The cost of improving this system of roads will depend not alone upon the width to be paved, but also upon the material to be used.

I have called attention heretofore to the increase in the motor driven traffic, but this only indicates the change that has already taken place. In all probability the change has but only begun and in the future it will all be in the direction of a large increase, both in the number and in the weight of the motor vehicles. Motor trucks which are much more destructive to roads than automobiles will at no far distant day come into general use, both from the city to the country in carrying freight and from the country to the city in the marketing of farm products. Our main traveled roads, therefore, must be built to standard grade if possible, with a substantial foundation and hard wearing surface, such as brick or concrete.

To accommodate the traffic the 50,000 miles, 18 to 20 feet wide, constructed as above indicated, would cost not less than \$15,000 per mile, or a total of \$750,000,000 for the entire mileage. The 250,000 miles, averaging from 12 to 16 feet would cost approximately \$10,000 per mile, or \$2,500,000,000; thus making the total cost of the entire 300,000 miles \$3,250,000,000.

We are now ready to consider what political divisions or taxing bodies should be responsible for this expenditure.

State road legislation in its beginning, put the entire responsibility of road improvement upon the smallest political divisions, viz: the townships or road districts, this being based on the theory that our road conditions were purely a local matter and concerned only the local communities. After a few decades this manner of handling the road question (because of the broader ideas of the people as to the value of good roads) was found insufficient. In some States the counties were then made the political divisions responsible for road improvement. A little later the county system was found inadequate

and most of the States through State-aid have joined the partnership for road improvement. The enterprise, however, is growing so rapidly that it is becoming apparent that we shall need the assistance of the federal government in carrying on this great work. As I have previously indicated, the people of the United States from one coast to the other and from the north to the south are awakening to the fact that road improvement is essential and urgent; that the task is so great that all the forces must combine for its solution.

The government has about completed one of the most stupendous undertakings of modern times, the Panama Canal, at a cost of from \$300,000,000 to \$350,000,000. The time is now ripe for the federal government to undertake a greater work, one that will be of more direct benefit to our people from the standpoint of a higher citizenship, a contented farm life, as well as from the standpoint of the effect upon the food supply of the nation, than a score of Panama Canals. Each year the government is appropriating very liberally for public buildings, for improving rivers and harbors. Much of this work is necessary, but none of it would benefit the people so much as the same amount of money applied upon the proper development of a well planned and equitable system of highways.

As has already been suggested by others, if all the associations of the United States, national, State and county, that are now working for road improvement could unite in asking Congress to authorize the appointment of a commission whose duty it shall be to conduct a thorough investigation and report back to Congress a plan recommending the extent to which the government shall enter into this work; to report also whether the government shall construct and maintain a system of national highways or give to each State its proportion of assistance in improving State roads; and further to provide a plan by which the roads to be improved shall be designated. If, I say, this plan could be put into effect then this great project would soon be under way.

If we grant the premises in the foregoing discussion to be true, then the conclusion is also true that we are warranted in asking that the government shall over a period of fifteen or twenty years assist in this road movement, at least to the extent of the cost of the 50,000 miles of interstate highways which we have estimated at \$750,000,000. Congress has authorized the issuing of bonds for the building of the Panama Canal, a project of approximately half the cost of this system of highways; and should the revenues of the government require it, bonds should likewise be issued for the construction of our highways. If the government undertakes to furnish this \$750,000,000, as above, there would still remain the sum of \$2,500,000,000, to be contributed and expended by the States and counties, in proportion to the total mileage of each State. This amount of money spread over a period of fifteen years would mean an annual cost of \$166,000,000 to the States and counties of the nation. This is indeed a large annual expenditure, but let us analyze the situation.



Let me again call your attention to estimated annual traffic loss of \$250,000,000. When we shall have improved the roads that carry 80 to 90 per cent of this traffic, then we shall be saving from 200 to 225 millions annually, hence from this standpoint, the improvement will soon pay for itself. Again, we are now expending annually on our roads and bridges in the United States a sum estimated at \$180,000,000, \$150,000,000 of which is being raised by general taxation and \$30,000,000 by bond issues. This, as you will notice, is largely in excess of the annual expenditure called for in this proposed system of roads. Of this sum \$180,000,000, \$100,000,000 is now being expended in building and repairing bridges and culverts and caring for the earth roads and \$80,000,000 in the more permanent types of road construction. These earth roads are bound to constitute by far the larger part of our roads to come, and we must continue not only to care for them as we have done in the past, but to increase their efficiency by more thorough and scientific methods of maintenance.

It is generally conceded that at least 25 or 30 per cent of money now expended on our earth roads is being used in a haphazard way that brings no permanent benefit which would mean that \$75,000,000 economically administered would give us a much better system of earth roads than we have today and leave \$25,000,000 for other purposes. If this \$25,000,000 could be added to the \$80,000,000 now being expended on hard roads, we would have a sum of \$105,000,000 for that purpose and thus leave only about \$60,000,000 still to be provided for. Without question the taxes for the maintenance of State governments, municipalities, schools and roads are already a sufficient immediate burden upon the people. I therefore feel justified in taking the position that this project is too large to be paid for through the regular channels of the State and county taxes; and that at least the \$60,000,000, above referred to, in addition to the \$30,000,000 now being raised by a bond issue should be provided for by the same method, viz: the issuance of bonds.

Our third requirement is that the improvements shall be of sufficient permanency to give full value to those who will be called upon to repay the indebtedness; in other words, that the maturity of the bonds shall come within the life of the improvement, or in the language of roads that we should not issue fifty year bonds to build fifteen year roads. This principle has often been disregarded by States and municipalities, not from a desire to impose a burden upon those who have to pay the cost, but from a lack of correct information as to the durability of the work for which the bonds were issued. I believe that this has been to a considerable extent excusable in the matter of road construction, because of changing traffic conditions that could not be foreseen. Those in charge of this construction have lived up to the best information obtainable and built along lines approved by the best road engineers. The failure of this class of roads to withstand the changing traffic is not sufficient reason, however, why bond issues should not be utilized within proper limits in the future.

We are today in position to judge sufficiently of the traffic requirements for the next twenty years to be able to build our roads to meet those requirements. This being true, it then follows that inasmuch as the coming generation is to share in the benefits of the roads, equity demands that it should also share in the cost which can only be done through the issuance of bonds.

We do not hesitate to issue bonds for other public improvements, such as water works, sewer systems, lighting plants and school buildings. None of these improvements are permanent. All require maintenance, many require frequent renewals to maintain efficiency, but if the foregoing principle is observed no injustice results. If we shall attempt to build this system of roads, spreading the work over a period of fifteen years, building one-fifteenth each year, paying one-half the cost of this portion by direct tax, and issuing fifteen-year bonds for the remaining one-half, we would distribute the cost over a period of thirty years; but each section of road so built would be paid for within fifteen years from the time of its construction. The burden upon the taxpayers would be but little more than at the present time; further it is evident that through a proper organization of the work by our states and counties with a definite purpose, the money would be conserved; haphazard work would be eliminated, and the people would receive real value for the money expended.

Let me summarize briefly: I have called attention to a few of the evidences of the urgent need, as well as the insistent demand for road improvement. I have given you an idea of the vast sum of money that will be required and have tried to show the necessity of enlisting all of the available forces in this work, from the road district to the federal government. Further, we have seen that the work should not be delayed indefinitely but that, in order to have this generation receive a share of the benefits, we must resort to bond issues by each of the taxing units entering into this work; also, it is clear that equity demands that through the payment of bonds a share of this burden be placed upon the future taxpayers, who will enjoy their proportion of the benefits.

The people are in earnest in their demand for good roads and when they unite in demanding anything they always get it. Whether the methods by which they get it are sane and conservative and give the people real value for their money, depends upon the leadership. No man can lead, unless he has the vision. No man should be permitted to lead, unless the vision is counterbalanced by conservatism. No man should be permitted to lead, except along the lines of the newer ideals in public affairs, which are nothing more than common honesty and unselfishness.

**MR. MYERS (of Ohio):** We have discussed road construction and maintenance and we have certainly profited very much. It is a national affair. We are correspondingly responsible, with justice to all. We come down to upkeep and protection, which has been



discussed and which has been very vital, and we are now down to bonds and maintenance. It occurs to me that it is only fair that the farmer, who is assessed by the township and by the county, could be protected in a way, and while they are expected to use the roads and they are willing in the main to be assessed, they are not willing that those roads that cost from \$2000 to \$25,000 a mile, according to the different methods employed, should be maintained at an expense in the issuing of additional bonds, incurring additional hardship because of that maintenance being severe, owing to the fact that because of the use of motor tractors now used on those roads between our city and Cleveland, Mansfield and Akron, carrying six to eight tons—half as much as we can put into an express car, without being assessed for commercial use. This does not appear right to me as compared with the farmers use and what he is paying for it, and I think this being a national affair, it is only proper that we should consider some revenue (instead of issuing additional bonds) accruing from those who use the roads in a commercial way. Those of us who are engaged in railroad and traction lines have first got to pay for the right of way, we pay \$10,000 to \$25,000 for equipment, we are assessed very heavily as you know, by each township and county through which we pass, and then we have to pay tribute to the interstate commerce and public utility and all that, and here comes along the department stores or the men who manufacture raw material and distribute their wares over the highways that are made by assessment on the common public, and it occurs to me that it is a very important matter that we should take up and see that those who use the roads in a commercial way, for commercial gain from one city to another, such as I have named, which occurs here no doubt in Detroit and intermediate points, should be made to pay by paying a certain duty on benzine or something which would protect them or protect the wayfaring public as against the inequality that is existing and will exist.

A. E. BEABY: I believe in good roads. I am a farmer over in the western part of Michigan. I own automobiles; I am willing to help pay my share, a goodly share, to build good roads, but every dollar I pay for good roads, I want to be an efficient dollar. I don't want to pay dollars to pay interest on bonds. I don't want to be bonded or have my children after me bonded for good roads. This good roads question is an everlasting proposition. Two million miles of roads in America—this emergency is continuing, this emergency is going to be here for a hundred years and there is no more good reason for issuing bonds for good roads than there is for issuing bonds for the running expenses of the State of Michigan. In some way and somehow, we farmers have been getting our products to the market. Now, you may not understand me, the language of a farmer is different from the language of a banker; it puts me in

mind of an old sailor that came into our county years ago. Instead of talking to his team as the near ox and the off ox, when they turned the yoke he says, "You blamed starboard ox, you get over on the larboard side." We have and have had too many politicians in this country who were starboard fellows at home but when they got to Washington they got on the larboard side. We don't want \$750,000,000 of bonds issued to be carried on the backs of these people; it will create a higher cost of living than anything you can do. I am willing to stand any burden of direct tax that they see fit or that the public is willing to put on to me, to make it a direct application for the building of roads, but I do not want to see sixteen-year bonds issued nor twenty-year bonds issued and at the end of that time we have paid for 2 miles of road and only got 1 mile of road built. Now, I am interested in banks; I have often been interested in banks and have always tried to get my interest out and am getting it pretty near all out of them and I am willing to stand a good heavy tax for good roads. I believe that money expended that way, in a public way, adds more to human happiness and the comfort of animals than money expended in any other way, but give us a direct tax and let us pay as we go. I thank you, gentlemen, for your kind attention.

MR. BRADT: They have authorized bonds for the Panama Canal but have only issued \$140,000,000 out of an authorized issue of \$350,000,000. The government revenue will take care of it, and this \$50,000,000 over fifteen years or \$37,500,000 over twenty years will undoubtedly be taken care of through regular channels of taxation by the government, just like the Panama Canal, and I suggested roads instead of some other improvement the government is making, but not a bond issue; I said that bonds should not be issued unless the life of the improvement is within the life of the bond, so that the man who pays those bonds gets full value received for his money. Now, in its relation to the farmer, this matter of the motor traffic, I think that will be taken care of by our State legislature through a motor vehicle tax which will be graduated according to the size of the motor, but I think this, that our farmers will be using these large motors before many years themselves. I think I have shown that the automobile end of it will draw no line in the future between the farmers and the residents of the town, because the farmer is going to own more automobiles than the townpeople, and when it comes to auto trucks, I think it will be the same in a few years.

MR. SMITH (of New Jersey): Mr. Bradt brought the paper up to a certain point, but in this matter of issuing bonds did not go far enough. We had a case in New Jersey where we had laid out a 7-mile road across country to the railroad station. Before that road was built, they had been carting one ton to the load; since the road was built, they have been carting three tons to the load. An



old farmer had objected to it, and he was the only one along the route that did object but he soon "tumbled" and was doing his carting with the rest. We then talked of another good road and proposed to issue bonds for \$20,000 and have this road for use also. Immediately after the first road was built, the land along it had risen from \$80 an acre to \$100 an acre, and just as soon as the State road was finished, the farms along there brought \$100 to \$120 an acre. Then another old farmer objected and brought up the argument "Don't you think it would be a very mean trick for me to vote for them bonds and leave that debt to my children for an inheritance?" I said, "Your farm has risen 20 per cent; you are saving \$450 a year in cartage; don't you think it would be better to build the road and issue the bonds and leave to your children a farm worth 20 per cent more money?" He said, "Golly that's so, I didn't see it that way, and I will vote for it sure pop?"

MR. BEABY: But if that farmer had paid it all and left no bonds for his children to pay, he would be doing a better act yet.

MR. SMITH: But unless we had issued the bonds, we could not have had the road.

MR. BRADT: Those children are to get the benefit of the road and ought to pay for it.

MR. BEABY: I don't believe in bonding the unborn in this country; I don't believe there is any patriotism in that at all.

MR. BRADT: They are going to get some benefit of what we do here and it is no harm for them to pay a little.

THE CHAIRMAN: The next paper is "Highway Accounting with Special Reference to Maintenance," by Halbert P. Gillette, Chief Editor *Engineering and Contracting*.

## HIGHWAY ACCOUNTING, WITH SPECIAL REFERENCE TO MAINTENANCE

By HALBERT P. GILLETTE, M.A.M.Soc.C.E.

Chief Editor of "*Engineering and Contracting*"

The time is at hand when accounting and cost keeping methods that have proved so effective in the management of private enterprises will also be universally applied to public works. There is fundamentally no economic difference between a road and a railway. Hence accounting methods that have been developed in the construction and operation of railways should prove efficacious in road construction and maintenance.

Every well managed railway has an itemized plant or property account. How many ledgers relating to a system of highways will show the itemized investment in the entire mileage? Every well managed railway has an itemized maintenance account that shows the monthly and annual maintenance expenses by divisions. Of how many road systems can the same be said? Every well managed railway is careful to distinguish between expenditures that add to the investment in plant and expenditures that merely renew superseded and worn out parts of the plant. How many road ledgers show equal care in this vital matter? And it is vital, economically, not to confuse renewals with betterments; yet we all know of many recently published statements of road maintenance costs wherein more than half the cost was not maintenance at all.

When an old waterbound macadam is scarified and enough new metal added to bring it to its *original* thickness, the cost thereof is a maintenance expense. But if metal is added in amount sufficient to make the macadam 8 inches thick where it was 6 inches thick at the time of original construction, then the added 2 inches is not a maintenance expense, but is an addition or betterment which should be charged to the property account. Even to a more marked degree is this true when a waterbound macadam is given a bituminous surfacing.

The editor of at least one prominent engineering periodical has recently written the almost prohibitive cost of road maintenance, and has cautioned the public against bonding for road construction because of the short life of modern roads. This serious editorial error is the result of inadequate knowledge of proper accounting methods, for published road maintenance data are apt to deceive those who think that "maintenance" means what it should mean. As a matter of fact "maintenance," as commonly used today in reference to roads, means true maintenance and betterments combined, and is therefore a deceptive term.

Maintenance expense should never include anything else than repairs and renewals. Any expenditure that adds to the inventory cost of a road is an addition or betterment and should be charged to the property account. By this criterion it follows that if a worn 6-inch macadam is scarified and increased in thickness to 8 inches, the first cost of a 6-inch macadam is deducted from the first cost of an 8-inch macadam and this difference is charged to the property account. The balance of the expense involved in scarifying, metalling, rolling, etc., should be charged to the maintenance account under the head of renewals.

The writer prefers to keep distinct the two kinds of maintenance—repairs and renewals. Under repairs are charged patching, patrolling and other small or continuous maintenance expenses. Under renewals are charged general resurfacing and all renewals of large parts or units. Thus, in the case of a bridge the cost of painting is a repair expense; but the replacement of an old bridge by a new one is a renewal.



Since it is rare that a highway official will find a properly kept set of construction and expense ledgers left by his predecessor, the question arises whether it is worth while to inventory or appraise the existing roads. Most emphatically it is worth while. One of the best ways of rating the annual maintenance cost of any structure or machine is as a percentage of its first cost. Obviously this cannot be done where the first cost is not even vaguely known. Estimates of future maintenance expenses are often best determined by taking percentages of the first cost of each item. These reasons alone warrant making an appraisal of any plant, but, in addition, the owners of a plant are entitled to know how much capital is invested in it. Who can tell with any degree of accuracy how much capital is now invested in the roads of any large State in America?

The writer has made a rough estimate of the investment in roads in each state, and it serves at any rate to disclose sad disparity in capital invested in roads compared with railways. Accurate figures of this sort for each state should serve to awaken the public to realization of its past niggardliness in road improvement. Now that the Interstate Commerce Commission has begun the appraisal of all the railways, it will soon be possible to contrast the investment in railways with the investment in roads, provided we begin soon to appraise our highways.

In opening a property account for a system of roads, it will be well to study the printed instructions to railway accountants issued by the Interstate Commerce Commission; also the printed instructions issued by various state public service commissions.

The writer would suggest a property account for roads as follows:

#### ROAD PROPERTY ACCOUNT

1. Engineering, superintendence and inspection.
2. Administration and legal.
3. Real estate and right of way.
4. Clearing and grubbing.
5. Grading.
6. Retaining and slope walls.
7. Bridges, culverts and drains.
8. Fences and Signs.
9. Trees, sod and foliage.
10. Paving.
11. Buildings and fixtures.
12. Furniture and instruments.
13. Stores and supplies.
14. Tools and machinery.
15. Miscellaneous.
16. Bond discount.
17. Interest during construction.

All existing roads should be appraised at the cost of reproduction *new*. The depreciated condition may be ascertained, but it

is the cost new that should always appear in a plant account. It is now considered bad accounting to "write off" any part of plant value because of depreciation. Preferably a separate account called depreciation reserve is provided.

Having opened the construction ledger of a system of highways, using the appraised cost of reproduction new to start with, the cost of every new road and every betterment should be entered in that account, item by item. Many of the seventeen items above given should be classified into sub-items. Of course each new road improvement should have its own separate itemized account, and it would be well to adopt the method used by railways in designating each improvement by a numbered A. F. E. An A. F. E. is an "Authorization for Expenditure." It is made by filling in a printed blank with an itemized estimate of quantities and cost of the proposed improvement and the reasons why the improvement should be made. It is given a serial number, and signed by various officials. Care should be taken to keep the record of actual cost in such a way that it can be entered in detail on the original A. F. E. in a column parallel to the column of estimated cost. If the totals of the two do not check within 10 per cent, reasons should be given for the difference. Instead of extending a given A. F. E. to cover more work than was originally contemplated, the writer prefers to issue a separate A. F. E. for the extension.

Corresponding to the A. F. E. for large additions and improvements is the W. O., or "Work Order," for minor betterments and maintenance. Work orders should be numbered serially, and, where possible, should contain detailed estimates of cost as well as the actual cost in equal detail. In addition, a work order should show in detail how the actual cost is prorated between Maintenance and Improvements.

The location of the work should be described on each A. F. E. and W. O., but, in addition, there should be a map record of every A. F. E. Care should be taken to enter on the map the numbers of the A. F. E. and on the A. F. E. should be recorded the map number. If this is not done, it often becomes difficult in subsequent years to correlate the maps and A. F. E's.

In addition to a system of accounts that find final summary in two sets of ledgers, namely construction ledgers and maintenance ledgers, there should be a separate system of unit cost-keeping records. Ledger accounts must be precise. Cost-keeping records, however, need only be approximate; for the main object of cost-keeping is to ascertain unit costs with sufficient accuracy to determine whether work is being economically done. Of course unit costs also serve for estimating the cost of projected work, but this is a matter of small importance contrasted with the use of unit costs as a criterion of efficiency. Accounting is a function of bookkeepers and accountants, but cost-keeping is a function of engineers. By this I do not mean to imply that engineers should not understand



accounting, nor do I mean that there should be entire divorce of accounting from unit cost-keeping. To attempt to record in ledgers the data needed in calculating all unit costs results in greatly complicating the accounting system. Moreover, a good accounting system lacks the flexibility so essential in a good system for recording unit costs. As a rule, the engineer in charge of work finds it desirable to change the method of recording unit costs to fit the local conditions, the character and magnitude of the work, and the sort of men available for keeping the records. An accounting system, on the other hand, should remain the same for all jobs and from year to year.

Of course unit cost records should show labor and material costs separately. It is desirable that the same separation should also be followed in the accounting system. When this is done it is possible to check roughly the total payroll charged in the ledgers against the total labor cost recorded by the engineers on their cost blanks. Similarly with the total cost of materials. Errors are thus frequent disclosed, and occasionally the "padding" of payrolls and other dishonest acts are brought to light.

Too much stress can not be laid on the economic necessity of detailed unit cost-keeping. Even for the smallest of jobs, unit costs should be ascertained, if for no other reason than to show that unit costs on small jobs are often several fold as great as on large jobs of the same character. Much money is annually wasted in puttering. Once the total waste is expressed in dollars it usually is seen that most of the puttering can be done away with entirely. This is particularly true of road maintenance. The writer is of those who believe that too much road maintenance consists of patching in small units. There is not a little economic falsehood in applying too literally the "stitch in time" policy. Unit costs, and nothing but unit costs, will show to what extent it is economic to use a parole system of repairing.

To unit costs we must also look for the answer to the question whether day labor or contract labor is more economic. Practically all the recorded unit costs relating to road construction indicate that contract work is cheaper than day labor work. The a priori reasons for this are numerous; but since there are not a few men who believe they can "save the contractor's profit" simple justice demands that they prove it by recording and publishing the unit costs that occur when they attempt to do so.

In conclusion the writer would repeat the suggestion that the accounting methods of railways and other public utilities be thoroughly studied by those who are in charge of highway construction and maintenance.

It is not sufficient merely to know the principles of double entry book-keeping as it is commonly applied in business enterprises. Public utility accounting is a special science that involves many departures from the ancient art of book-keeping from which it has evolved.

THE CHAIRMAN: This session is going to come to a close. The next is the Economics Session. Upon this question I believe in the principles of equality and the right of the people to rule. That was established in the beginning of this government, as you all remember, when our forefathers, under the leadership of Jefferson, said, "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their creator with certain inalienable rights; that among these are life, liberty and the pursuit of happiness. That, to secure these rights, governments were instituted among men, deriving their just powers from the consent of the governed;" and upon this question of roads, we will have the kind of roads that the people of this government want in every part of this Union, in every township and county of it. Now, we are going to have what the people want. I take pleasure in introducing to you Dr. Joseph Hyde Pratt, who will now preside over the economics session.



## ECONOMICS SESSION

UNDER AUSPICES OF AMERICAN HIGHWAY ASSOCIATION

DR. JOS. HYDE PRATT in the chair.

THE CHAIRMAN: I will ask the session of economics to come to order. We will take up at this session perhaps the most important phase of the road problem—the administration of road funds. No matter how much money you have raised with which to construct roads, or how you have raised it, if it is not expended in building *good* roads, and expended economically, you have lost out on the road problem. It is absolutely essential, in carrying out the expenditure of any money, whether raised by direct tax or bond issue, that that money be expended under the supervision of a man who knows how, i.e., the road engineer. He should be given such authority over the unit of his jurisdiction, whether it be a township, county or State as will enable him to expend the road money to the best advantage with regard to location, construction and maintenance of the public roads of the community for which he is working. Your road commission may decide what roads are to be built first, what places are to be connected; but the location, the method of construction and the maintenance should be left to the engineer who has been employed to take charge of the road work of the State or county; and, if he is not capable of doing that, he should get out and you should employ an efficient man. If we carry out that plan and do put in charge of our road work the man who knows how, we will be able to get out of every dollar appropriated a dollar's worth of good roads.

Now, in order that our engineer shall be able to carry out and do his work to the best advantage, he has got to have under him in the State or in the county as the case may be an organization that he knows will carry out his instructions in regard to the road work. I believe in deciding upon what character of road to build; whether concrete or vitrified brick; tar or asphalt macadam; sand-clay or gravel, should be determined by the amount of traffic that is to go over that particular road, which of course will determine the amount of money needed to construct that particular road. I do not believe that any community should incur debt to build the finest kind of concrete or asphalt or vitrified brick road when the traffic over that particular road does not demand such surfacing material and a sand-clay or gravel road surface would serve the traffic that goes over it just as well.

There is one thing in connection with road work that we should always keep in mind, and that is that no road, however well it may

be constructed, or the surfacing material may be, is a permanent road, i.e., it is going to constantly need repairs and in your organization, in your plans for your public road work, you should always arrange to have a sufficient fund at all times ready with which to maintain the road you have built. It is part of the work of the engineer in making his organization to work out a plan for the maintenance of the road as well as for its construction.

There is one part of a public road that we might call permanent, or at least it should be permanent, and that is the location. This is especially so as to sections of this country that are being built up. When the road is once located, if it is located by a competent engineer—a man who knows how—you have it in a permanent place and there should be no question about re-locating that particular road. Then, when you come to surface that road, if the traffic at a particular time simply demands a sand-clay or gravel surface put it on; and, later, in fifteen, twenty or thirty years, say, if the traffic becomes so great as to require some other surfacing material, such as tar or asphalt macadam or concrete or vitrified brick, you have a foundation for the new surface in that you have a good location and grade; and you will have, on account of increased traffic, accumulated wealth sufficient to give the money or the revenue with which to put on the different surfaces required by the increased traffic. The location, therefore, is the only part of the road that we can call permanent, and we should see to it that in all road work location be made as permanent as it is possible to do it with scientific skill and intelligence. I believe you will agree with me that the subject now under discussion in this session of Economics of Road Work is as important as any that we have taken up.

We have not a long program today, and I would like to ask Mr. Shirley, of Maryland, if he is in the audience, to come on the platform, and Mr. Wilson, if he is here, and also Mr. Atkinson, if he is here, to come on the platform. I have a copy of Mr. Shirley's paper, the title of which is "Systematizing the Purchase of Road Materials and Equipment." This paper has been printed, and as Mr. Shirley, apparently, is not here, the paper will not be read except by title, but it will be open for discussion by any of you who want to take part in discussing this subject. In order to start that discussion, there is just one word I would like to say in regard to this paper, and that is that I am heartily in accord with practically all that Mr. Shirley has stated in his paper in regard to systematizing the purchase of road materials and equipment. I want to carry that thought into what I said before regarding the engineer. I believe that the road engineer, who is in charge of road work in the State or county, should also have direct supervision of the purchase of all equipment and materials to be used in connection with the road work under his supervision. I don't care what character of men compose your county or road commission, who have charge of the road work and to whom the engineer is responsible, there is



no man on any such commission who knows what you need for your road work as well as your engineer who is in direct touch with every single phase of the road work. I am going to illustrate by one thing that happened in my own State, in a county where the county was a unit in road work and had their own engineer. The commissioners, who had charge of the road work and employed the engineer, did give him the authority over all the road work except at the start in regard to the purchase of supplies, materials and equipment. He insisted that the cost of all materials and supplies used upon the road work were items of cost that had to be estimated in average cost per mile of his work and he must know what was being ordered and what was being paid for the materials ordered. He insisted that he must have that authority or else he would not hold the position. They gave it to him and the first bill that he went over he saved that county his first year's salary. Now you can imagine what they were going to pay for the materials ordered. I may say that county had a bond issue of \$400,000 to spend on its roads and were buying equipment commensurate with that bond issue.

## SYSTEMATIZING THE PURCHASE OF ROAD MATERIALS AND EQUIPMENT

BY HENRY G. SHIRLEY

*Chief Engineer, State Roads Commission of Maryland*

The great increase in road construction, and the large amount being expended by many States and cities for material and equipment, makes the systematizing of all purchasing a necessity. All materials and equipment should be purchased by asking for bids and awarding the contract to the lowest responsible bidder. A purchasing agent should have full charge of the purchasing department, and should make all purchases. The system used by the State roads commission of Maryland, and inaugurated in July, 1912, under the present purchasing agent, is as follows:

1. A requisition is made out in duplicate (see form on p. 221) by a resident engineer, superintendent, or a head of a department. The duplicate is retained by the maker for his files, and the original is sent to the chief engineer, who examines and approves the requisition, or strikes out such items as he thinks unnecessary. The requisition is then submitted to the chairman of the commission for his approval, and then to the purchasing agent for his signature.

2. After the purchasing agent has signed the requisition, he immediately gets in touch with the material or machinery people, (as the case may be), and requests that bids be submitted by a certain specified time.

The requisition shows whether the material or equipment is to be used by the construction or maintenance departments; the contract number of the work on which such material or equipment is to be used; the person or persons, name or names to whom the article or articles are to be shipped, as well as the railroad station, section of road on which same will be used, and the name of the county in which the road is located. The requisition also shows the quantity or number of items desired, and a brief description of each. Satisfactory bids having been received, opened and tabulated, the contract is awarded to the lowest responsible bidder, and the order for material or equipment is made out on the order blank (see p. 222).

On the order sheet is specified each item, the requisition number, and to whom the material or equipment is to be shipped. The following printed instructions on the back of the order sheet, instruct the consignee how to ship:

1. Send all invoices to 601 Garrett Building, Baltimore, Md. Do not unduly delay shipment of order to complete same, but if necessary, forward in installments. Mail invoices with bill of lading promptly after each consignment. Order and requisition number must be marked plainly on each package and invoice. The number of packages should be marked on invoice.

2. INVOICE blanks will be mailed on application.

3. Do not send more goods than are ordered, as they will not be paid for, but will be returned at the expense of the consignor.

4. Accounts will be closed on the 25th of each month and paid on the first of the following month, and bills received after the 25th will go into next month's account, regardless of the date they may bear. No drafts are authorized or paid.

5. This commission will not be responsible for any goods shipped, unless covered by an official order from the purchasing agent.

6. Render monthly statements direct to purchasing agent.

7. Orders must not be filled at an advance in price over last quotation without first notifying this office and obtaining our consent.

8. All material ordered is subject to test and inspection. If rejected, it will be returned at the shipper's expense and must be replaced with material which will strictly comply with our specifications.

9. The option is reserved on my part of cancelling this order if not filled within 10 days from date, unless otherwise specified.

10. Render separate bills for each order.

Along with the order, the following three bill forms are sent (see p. 223).

The original bill gives the order number, the requisition number, the date of shipment, the name of the party to whom the shipment was made, the car number and initials, the name of the firm from whom the articles were purchased, and the date on which the purchase was made.

It is required that the name and kind of equipment purchased, be clearly and intelligently stated in the body of the bill, and no money





# STATE ROADS COMMISSION

## PURCHASING DEPARTMENT

E. H. ZOUCK,  
PURCHASING AGENT.

<p>THIS NUMBER MUST BE PLACED ON EACH PACKAGE</p> <p>Req. No. ....</p>	<p>ORDER</p>
--	--------------

Baltimore, Md., .....191.....

Please send to THIS COMMISSION THE FOLLOWING Material and forward bill of same in accordance with instructions on back of this order, which must be strictly complied with.

**See Notice on Back; which please read carefully.**

Above Material is purchased f. o. b.  
Freight must be prepaid on all orders shipped.  
Ship to

Mark State Roads Commission

Care of

If you cannot fill this order by date  
named, please advise me at once.

**F. H. ZOUCK,**  
Purchasing Agent.

Per .....

NOTE—Facsimile of Order Blank. Size of original, 8½ x 11 inches. In duplicate.



(ORIGINAL)

DEPT. No. ....

## STATE ROADS COMMISSION

Order No. .... Req. No. ....  
 Date Shipped. ....  
 Shipped to. ....  
 Car No. .... Initial. ....

BOUGHT OF .....191

Address }  
 (Street and Number) }

NOTICE—All Bills against this Commission for supplies ordered by the Purchasing Agent must be made out upon these forms, AND SENT TO PURCHASING AGENT'S OFFICE, Baltimore, Md., with Bill of Lading.

STATE NAME AND KIND OF MATERIAL CLEARLY AND INTELLIGIBLY.

Checked: Purchasing Dept. by I hereby certify that the above goods were purchased upon approved requisitions and that the account is cor- rect. ..... Purchasing Agent	Dept. Receiving, by I certify that the above supplies were received..... .....19, quantities, quality and weights correct. ..... .....	Aud. Disbursements, by CORRECT, CHARGE TO ..... ..... .....
--	--	---

NOTE—Fac-simile of Invoice Blank. Size of original, 7½ x 8½ inches. In triplicate.

will be paid out for material or equipment purchased, unless the bill is made out in triplicate by the consignor, on the forms furnished by the purchasing agent. When these forms have been properly filled out, the original is forwarded to the purchasing agent, together with the bill of lading. The duplicate and triplicate bills are sent by the consignor to the person for whom the material or equipment has been purchased, who signs the duplicate copy, thus showing that the articles named on the bill, were received, and the date on which they were received. He then, at once, forwards the duplicate bill to the head of the department, keeping the triplicate bill for his own files. Likewise, the purchasing agent forwards the original bill to the head of the department, who certifies that the supplies were received on a certain date, and that the quantities, quality, and weights are as ordered. The original bill is then returned to the purchasing agent, who certifies that the articles shown on the bill were purchased under an approved requisition, and that the account is correct. The bill is then sent to the auditing department for disbursement, after the name of the county, the contract number, and the item number to which it is to be charged, has been placed on it.

The system is very simple, as the requisitions, orders, and bills are all printed with the proper headings and directions, and it is only necessary, therefore, to fill out the blanks with the proper dates, numbers, items, etc., thus giving the minimum amount of labor for making up the order and bills.

Too much stress cannot be placed on the great importance of systematically purchasing materials, and equipment, and this can only be done by having an experienced purchasing agent, who will keep in close touch with the market, and who knows from whom the most advantageous purchases can be made.

A purchasing agent should be a man who has had experience in purchasing equipment and material, and of unquestionable honesty and integrity. Aside from the large amount saved by the systematic purchasing of materials and equipment by an experienced purchasing agent, the cash discounts for cash payments made within ten days, allowed on many bills, will pay the expenses and salary of the purchasing agent and his department.

**THE CHAIRMAN:** The paper of Mr. Shirley is now open for discussion. If there is no discussion of Mr. Shirley's paper, I will call upon the next speaker who will discuss the subject of "The Labor Problem in Road Construction." I take pleasure in introducing to you Captain P. St. J. Wilson, State highway commissioner of the State of Virginia.



## THE LABOR PROBLEM IN ROAD CONSTRUCTION

BY P. ST. J. WILSON

*State Highway Commissioner of Virginia*

Most of the problems in connection with labor in road work are identical with those in other similar work, and are familiar to all who are accustomed to handling labor. I therefore feel that I can be of little service in laying before you my troubles in this connection, having only a partial suggestion as to the remedy.

Road work, in order to get the best results, requires a certain amount of skilled labor, and also a certain amount of skill in all the labor used. The men who cut the ditches, shape the road bed and do almost any other work, can materially aid the progress by doing skillfully the work to which they are assigned. The real labor problem, as I have found it, is to secure regularly the amount of skilled and common labor necessary to carry on the work economically. My case is probably an extreme one. In Virginia most of our work has been remote from the cities, in sparsely settled communities, where they are few laborers without more or less regular employment; yet the work is so scattered that many of the pieces are too small to justify importing laborers from any considerable distance and making provision for their maintenance. We have therefore been compelled to rely largely on local labor, and are often seriously handicapped. Not infrequently has it happened that we have been compelled to shut down work for a month or more during the best road building season, while the labor went to harvest the crops in the neighborhood. When you are told that our joint State and county fund in a few counties is as small as \$1200 per year (ranging from this up to about \$20,000), it may readily be seen how little work can be done in some places. In a number of instances, where the amount of work was sufficient to justify the importation of labor, parties in the neighborhood, even farmers interested in the road, have taken the labor away by offering higher wages than we were justified in meeting, considering the price of labor locally and generally throughout the State. With us there are few contractors equipped for road work, and although we always advertise for bids on our work, we often have no bids at all, and still more frequently, the bids are so high that we are forced to reject them, and the consequence is that much work is done directly by the commission. During last August one hundred and thirty pieces of work were under way at the same time, scattered over sixty counties, and only twenty-eight of this number were under contract. To supply the necessary number of competent foremen and operatives, as well as laborers for these various pieces of work, has been probably the most difficult task we have had to contend with. On account of the small amount of funds available, many of the jobs last only a few months, the majority not continuing through the usual outdoor working season, which in our State

is from eight to ten months, and but few of them last throughout the year. Where the work is of short duration, we, of course, so far as practicable use one organization on two or more pieces of construction, but notwithstanding this, we are forced to the necessity to a certain extent of reorganizing our forces each year. We endeavor, as far as possible, by transferring the best men to the longest jobs, to keep a nucleus of foremen and operators from year to year. Sometimes, where it is practicable, we use the county superintendents or foremen in our State work, but it is generally the case that these men are occupied with the county work at the time we could use them.

As to the common labor, we have found it necessary to practically build up a new force annually in each county, though we frequently get back some of the local men we have used the year before.

This is, in brief, the labor situation as we have it in Virginia today, and there are doubtless other States contending with more or less similar conditions. The solution of the problem has not been reached fully by us. As to what we may call the skilled labor, time has helped us much and we have a certain number of trained foremen and operatives which is increasing from year to year and which will in time, I hope, be sufficient to meet the demand, notwithstanding the fact that we lose some of them every year on account of the irregularity of the work. But I must express the hope that in what has proven so far our nearest solution of the common labor problem, we shall never have enough men to supply our demand. Otherwise there must be a great increase in crime. So far as they are available, the convict practically solves the problem for us—with them we have no pay day drunks, no strikes, except now and then an escape, and many of the irregularities connected with the attendance of the free labor are avoided.

There are at work on the roads of Virginia about fifteen hundred convicts. They are divided into forces varying in numbers from forty to seventy-five, according to the class of work they are engaged in. Altogether, there are twenty-seven of these forces, each in a different county. While we may have some labor problems with these, the chief one is eliminated on the work on which the convicts are placed, viz: that of keeping a sufficient amount of labor. We are better able to keep good foremen on these jobs also because they are kept going all the year round. While as a matter of economy we have to close down free labor work during the severe weather of winter, we find it economical to keep the convict work going on continuously, as the men have to be cared for whether at work or not. Certain classes of work can be found to be done in winter, such as quarrying and heavy rock grading in mountainous sections of the State and in the lower sections where no stone is available, the climate is milder and sufficient work can be done to justify the additional outlay for working when both men and teams



have to be cared for in any event. In January of this year 72 per cent of possible working days was made, while in July 90 per cent was made. These percentages are based on an eight-hour day in January and ten-hour day in July. Among the convicts we not infrequently find men capable of running steam rollers, engines, drills, etc., and a large percentage are made trusties and used as teamsters, messengers, etc. The average cost of the convict labor per ten-hour working day for the past three years has been 52 cents, as compared with wages ranging from \$1.25 to \$1.50 for free common labor. To offset this discrepancy in cost to some extent, there are some disadvantages in working convicts, the chief one of which is the necessity of keeping them always immediately under the eye of the guard, thereby in a measure crippling their usefulness; sometimes, too, partially crippled men or semi-invalids are sentenced to the roads, which reduces the general efficiency of the force. Notwithstanding these handicaps, however, these foremen and contractors who have worked convicts under our system very generally express a preference for them over free labor, and I am satisfied they are fully 90 per cent as efficient as the average hired labor. Recently we have had voluntary applications from three contractors for convict labor to be furnished to them and charged on their estimates at \$1 per day per man, which is the established rate when this labor is used by contractors. All felony convicts, not considered too dangerous, and all inmates of the jails are subject to duty in the State convict road force. This force is fed, clothed, guarded and transported at State expense and is furnished to the counties on the requisition of the State highway commissioner as one form of State aid, and is worked under the supervision and direction of the highway commissioner. Under our statutes the convicts are at all times, whether working for contractors or otherwise, under the supervision and control of the State prison authorities, which insures the proper food and treatment and eliminates the possibilities of the many cruelties which have been reported in connection with prison contracts in the past. The men are worked in the open, well fed and housed in sanitary quarters, with the result that they are greatly improved physically and capable of earning a living when discharged.

After a close study of this question and seven years' experience in the work, I am convinced that so far as they are available, the use of convicts in road work under conditions as we have them in Virginia solves the problem of labor in road construction and also goes far towards solving the problem of what to do with our convicts.

**THE CHAIRMAN:** The discussion of this subject will be continued by Mr. W. E. Atkinson, State highway engineer of Louisiana. I take pleasure in introducing Mr. Atkinson to you.

## LOUISIANA HIGHWAYS

By W. E. ATKINSON

*State Highway Engineer*

There has been a general awakening in Louisiana to the necessity of better roads. Whether this awakening is due to the extended use of motor vehicles, to the spirit of progressiveness which is now sweeping through the State, or to the special activity of the State through its highway department, it is hard to say; but the awakening has taken place and may be the result of a combination of all these causes.

Nearly every parish in the State has voted a special tax for highway improvement or is about to do so, and twenty-one parishes have applied to the State for aid out of the revenues of 1913. Apportionments have been made to thirteen of these parishes and the department hopes to be able to make apportionments to the others in the near future. The apportionments already made embrace the construction of about 215 miles of highways, to cost approximately one-half million dollars. From January 1, 1913, to September 1, 1913, the department has completed four highways, representing a mileage of 108 miles. There are at this time four highways under construction, aggregating a mileage of about 95 miles.

The act creating the highway department is considered to be a model of State road laws. It not only creates the department, but provides the department with funds with which to operate and with which to lend State-aid, and bestows upon the department such powers and privileges as render the whole system most effective.

These general remarks are made simply to give you an idea of the volume of work being accomplished on the highways of Louisiana and the keen interest taken in this subject. As requested by this Congress, I will now endeavor to tell you in detail concerning convict labor as applied to highway construction in Louisiana and you may draw your own conclusions as to its efficiency.

One of the most effective and interesting features of the act creating this department is the use of State convicts. With us, the greater part of the State convicts are negroes, who, when properly controlled, make very good laborers. They are treated with every consideration, well fed, clothed and groomed, and are made to keep regular hours and to observe all hygienic laws and regulations.

The penitentiary laws of this State are the best of their kind, and permit the use of convicts on the levees and the roads, but always under the care and supervision of the board of control, a State institution. Those not necessary on the farms and plantations owned by the State and operated by the board of control, are sent to work on the public levees and roads. While at work on the levees, they earn revenues for the board of control, as the work is



done under contract at an agreed price per cubic yard. However, they earn absolutely nothing for the board of control when at work upon the roads. The entire expense of their maintenance, while road building, is paid by the parish employing them. With the gratis services of the engineering corps of the highway department, the parishes have an excellent form of State-aid in addition to that secured in a monetary way.

The floods of the last two years caused much damage to the 1600 miles of levees in Louisiana and in consequence, the State found it necessary to withdraw all convicts employed on the highways, in order that the levees could be made safe as soon as possible. Now that this work is completed, I do not think that it will be long before the State highway department will be permitted to use a large force of convicts for highway construction.

About 175 miles of highways have been constructed with convict labor in Louisiana; most all of the roads so constructed were of the improved earth and sand-clay type. While constructing these roads, it was necessary to move camp frequently and the loss of time occasioned thereby, together with other expenses in connection, made the cost of construction just that much more. However, the saving effected by employing convicts as compared to similar work let by contract, is fully 40 per cent and in some instances 50 per cent, and I am of the opinion that a greater saving could be effected in constructing highways of a more permanent nature, which would not require the moving of camp so frequently.

In addition to the cost of maintenance of the convicts, the principal items of expense in operating a convict camp are the salaries of captains, foremen and guards, which are paid monthly, as follows: captains, \$75; foremen, \$40; guards, \$30.

The following figures are taken from the official records of the board of control, State penitentiary:

<i>Average number of convicts employed on public highways 1909—71.3</i>	
Cost of maintenance, per man per year.....	\$68.82
Cost of operating, per man per year.....	82.45
Cost of general expense, per man per year.....	16.91

Total cost..... \$168.18

<i>Average number of convicts employed on public highways 1910—147.3</i>	
Cost of maintenance, per man per year.....	\$68.82
Cost of operating, per man per year.....	86.71
Cost of general expense, per man per year.....	16.91

Total cost..... \$172.44

<i>Average number of convicts employed on public highways 1911—140.0</i>	
Cost of maintenance, per man per year.....	\$63.70
Cost of operating, per man per year.....	90.85
Cost of general expense, per man per year.....	16.25

Total cost..... \$170.80

With proper handling and with the coöperation of the board of control of the State penitentiary, there is no doubt in my mind that convict labor, properly organized and equipped, will prove efficient and economical, as has already been demonstrated in my State. Of course, I am speaking of conditions as they exist in my State, and I am not prepared to say whether this class of labor would prove profitable or economical in other States.

I know from actual results obtained that our department would be able to double the mileage of State highways constructed if we were to use convicts exclusively. Believing that the State would receive indirectly greater benefits and value from roads, I would, if this matter was left to me to decide, place every able-bodied male convict to work on the public roads, until the proposed system, embracing the construction of 4500 miles of State highways now contemplated by the highway department, is completed.

If the convicts were available, and with proper organization and equipment, I believe that 70 per cent of the parishes would avail and tax themselves to maintain a camp of fifty men each, until the roads in their respective parishes were built.

#### FORCE ACCOUNT LABOR AND CONTRACT LABOR

Now, as to force account labor and contract labor, and to state which is the better, is, in my opinion, a very difficult question to decide. My experience with both methods has taught me to judge each project on its own individual merits, taking into consideration the character, extent and available equipment that could be used in its construction.

Both force account and contract labor have their advantages and disadvantages, and the question of deciding which is the most economical and practical, should, as a general rule, be determined by the engineer in charge.

Work performed under force account oftentimes results in the better and more permanent construction and at a less cost than under contract, and again, in some instances, resulting in more expensive construction, yet invariably as good or better and more permanent than that done under contract. Better work because you are not restricted as a contractor would be to the specifications, but would if you so desired, do extra work and add extra or better material as the conditions require. While employing force account labor, the question of using inferior materials, the desire to rush the work to completion and not giving the proper attention as to workmanship, is almost eliminated.

If the contractor and his equipment are employed under force account, he would not have any motive for substituting inferior material or workmanship, so long as he is getting paid for services rendered. Again, if a contract is taken at a low figure and the contractor sees that he is going to lose money on the job, you will in-



more or less trouble in having the work done according to specifications. Yet, on the other hand, if the work is done by force account with poor or inadequate equipment and labor and the work to be done is not sufficient in quantity to justify the purchase of additional equipment or justify the establishment of the necessary discipline, then in that case force account labor is unquestionably the most economical and

method. I would reiterate that each project must be studied and decided upon by the engineer or owner as to which method is the more suitable.

A contractor bidding on a small project will be inclined to bid a lower price for the same class of work than if he were bidding on a large project. Notwithstanding the increase in the price bid, it is in many cases advisable to award the contract, for the reason that that would be saved in employing force account labor and the delay occasioned in equipping an outfit to do

the work. In the highway department in my State is very much the same more or less this phase of labor and force account.

We have in my State, construction work that is being done under free labor, parish prison labor, force account labor,

All free and force account labor is classified; that is, skilled labor on work requiring such and common labor on work of this kind, and so on. The State owns a road outfit, consisting of teams, wheelers, scrapers, road machines, traction engines, etc.; in connection with this outfit, we are employing teams, giving us a larger equipment.

In the parish of Sabine, where the State's outfit and force account labor are used in operation, we have a road that is being constructed by force account, also, this work being of the same character and of the same in extent. The road that we are building under

free labor and parish prisoners is being constructed on the other road of the same character under contract. As to these two roads, we are having constructed in the latter road some eleven miles long, under force account labor. We have employed a road grading outfit, paying the contractor so much per day for his teams and labor, but because of the construction of this road under this method, we advertised for bids for the work to be done under contract. The lowest bid on this work was 32 cents per cubic yard. This was a high bid, and out of line, the Department rejected all bids under free labor and force account, feeling that the work—including re-inforced concrete bridges and other work—would be done at less cost than the price bid.

Force account labor creates more trouble and more worry and also makes it necessary to employ more engineer assistants, time-keepers and superintendents.

The department places on each job an engineer assistant and any other necessary assistants that may be required, and he is looked to for results; he in turn looks to the foreman. If the foreman does not deliver the goods, "Out he goes." So far, however, we have had very little trouble with foremen and superintendents, as all of our work has progressed satisfactorily under this method.

The highway department of Louisiana was formally organized February 1, 1911, and although we have studied and solved many problems relative to highway construction, there still remains a number which will require more time and study for us to arrive at a satisfactory solution.

In conclusion, I will state that force account labor and contract labor are both good and it is a question of judgment as to which should be employed. You will note, gentlemen, that we in Louisiana are using both.

THE CHAIRMAN: The subject is now open for general discussion.

MR. W. P. EIRICK: There are just a few of us here and we are here because we are interested. If you will permit me, I would like first to explain why I am here so that you may know that I am interested and that I know what I am talking about. I was county commissioner in Cuyahoga County, of which Cleveland is the county seat, for eight years. During my term of office, almost all of the brick roads in Cleveland were built. I am not going into a discussion as to which is the best kind of pavement; that is for you to consider and determine yourselves. I do not care whether it is a gravel road, a macadam road, a bitulithic road, a concrete road, an asphalt road, or a brick road—what you are interested in is good roads and everyone of them is good, but some are adapted for a better purpose than others. Now we are discussing economics. I say that the question of economics comes in at this point—if you build a good road, Do you get your money back? That is the question of economics. I do not think the question of economics is, Is the money well spent? That is a question for you as taxpayers to demand of your elected officials. The question of graft in public improvements should be set aside, and if it is not set aside, it is your fault as taxpayers. You should elect, as officials, men who transact your business honestly and give you a hundred cents on the dollar for every dollar they spend for you; so the question of economics comes back—not what are you going to do about pavements? If you pave roads, Do you get your money back? That is the economical question. It is the question that comes up before the people of every State on every bond issue. What do we do in our county? When I was commissioner in 1904, Cuyahoga County had a tax valuation of \$240,000,000; it has got a tax valuation now of \$1,000,000,000, not caused by good roads entirely, don't misunderstand me, but on that account also. Cleveland has grown rapidly and



the suburbs have also grown; it has grown out in the country, but what do we do about pavements and the absence of it? I am not here to argue for a brick pavement because we put brick pavements in. You may like macadam pavements or a concrete pavement, it may be more adaptable for your particular purpose or location, but the question involved is, Do you get your money back? as I said before, and I will show you how you get it back. "Back to the farm" is the slogan. The rich man in the city says "I will go out in the country and buy a farm and live there and go home in an automobile;" and a man who stands on this platform and tells you that an automobile is a damage to a good road, makes a serious mistake. It is the automobile owner principally who pays the highest part of your taxation for good roads. He is the man that comes along at the crucial moment and says, if he has made some money in the city, "I will buy me a farm out in the country." And what does he do? Does he buy a farm for \$50 an acre? No, he goes out on an improved road and takes an old piece of land that sold for \$50 or \$60 an acre and pays \$300 for it and it raises the valuation out in that district, and along comes his friend and buys some more of the land. That is economics in road construction. I say that the question at stake in your good roads convention is this, Do you get your money back if you spend it for road improvement? There is no reason in the world why your money should not be honestly spent, but you should nevertheless look over your tax duplicates. I went into the commissioner's office as a layman. I sold logs for a living. I knew nothing about road improvement; I learned it after I was there. My thought was, as a business man looking after the interests of my constituents, Can we get our money back? Not what kind of a road—I was not interested in that side—but, if we improve this road, Can we get our money back? And I said to this man—and there was an engineer from that county who spoke to you today. Give us the road that we need, that is the point involved. Somewhere in the State you want a water bound macadam and should have it. Somewhere in the United States you want a gravel road and should have it. Somewhere else you want an asphalt pavement and should have it; different conditions merit different kinds of pavement, but the serious thought should always be, Do we get our money back? I can take you to Cuyahoga County and show you from the tax duplicates while I was commissioner there for eight years—and I am only out of office two months to go into business—we can show you that we got our money back tenfold before the ten years expired that they paid for these improvements, the tax increase, together with the levy, brought back more than the county put in the road. That is my idea of economics in road construction.

MR. LYMAN: I just want to ask a question, how they take care of those prisoners in the State of Utah? We use prison labor on

the roads, but our camp equipment is so expensive that I don't see how we could move as frequently as these people seem to move, and I would like to know how they take care of those prisoners, what kind of camp they have?

MR. ATKINSON: We have small houses or cages built on four or eight wheel log wagons and we also have cheaply constructed stockades built of rough lumber and logs. The prisoners are also guarded at night. The small houses or cages and the stockades are provided with ample openings and are screened so as to afford plenty of ventilation and be free from flies, gnats and mosquitoes. The work that has been performed under the convict system has been principally improved earth highways. This requires the movement of camp more or less frequently, thereby increasing the cost per cubic yard in grading above what it might cost if the work was of a more permanent nature and the yardage greater, thereby not requiring the movement of camp so frequently.

MR. SMITH (of New Jersey): Do you use the guards to any great extent or merely as a matter of form?

MR. ATKINSON: Yes sir, we have guards and we have to be on the alert at all times. We have trustees among the convicts used as teamsters and drivers in hauling gravel and material; they are also used around the camp as "flunkies" and cooks.

MR. SMITH (of New Jersey): About what percentage do you lose in the way of runaways?

MR. ATKINSON: Why, we lose one occasionally, but the percentage is very small, I would judge about 5 per cent.

MR. SMITH (of New Jersey): In some places they are dropping the striped suits altogether and putting the convicts "on trust." In the South we had to use the guards because the State law compelled it, but in Colorado they even take their stripes off and put them entirely on honor, except in a few particular cases.

MR. ATKINSON: Most of our prisoners are negroes and it is absolutely necessary to have someone to watch them. It is true that we have a few trustees among them, but as a whole, if they are not guarded, they will run away.

THE CHAIRMAN: I might say that in Colorado, they have, of course, been selecting the convicts that they put on the public road. They allow them a certain number of days—commute their sentence so much per month according to the work they do and work them without stripes and without guards. They now have certain convicts that are trying to become available for work in these convict



camps. In a talk with the superintendent at Cañon City, who has charge of the convict camps, I was told that they have had six or eight men try to escape but only one or two ever succeeded. Four of them came back of their own accord, and in the end they got all the men back. If a man attempts to escape, he is taken away from the camp and put back in the penitentiary and all the time that has accumulated toward reducing his sentence is taken away; and he has to serve out his full sentence. Now, if we should try to inaugurate any such plan in the South, we would have to do the same thing, pick out at first a certain number of the convicts, and try it with them and let the others see the advantages that the man who is trusted and put on his honor derives over those who cannot be trusted, and I believe in the end that we can work a large or fairly large number of the convicts in the South in the same way. I might answer your question regarding how we take care of the convicts by mentioning what we have in North Carolina at one of our camps what I call a temporary camp. The camp is located on the section of road to be worked.

This camp, which is located near Bat Cave on the Bank of Broad River, Henderson County, consists of a bunk house, or, as it is sometimes called, a "Cell house" 30 by 60 feet, in the center of which is a double deck platform called the cell, upon which are arranged the beds of the convicts. There is a clear space of 12 feet between each end of the building and double platform, and 6 or 8 feet clear between the cell and the side walls. The space between the two platforms is approximately 5 feet. Each man is allowed a single mattress, so that he has plenty of room for sleeping purposes. Four chains run the length of the platform cell: one each side for the lower tier and one each side for the upper tier. To these chains the convict is fastened by a light weight ankle chain at night. This is so arranged that there is little or no weight on the ankle and he can turn in any position he wishes while sleeping. The construction of such a bunk house depends on the time of the year and length of time it is to be occupied; but it is always built so that there is a plenty of air circulating through the building and that it may be kept warm and comfortable in cold weather. Guards are on duty in this building at night, one at each end.

Near to this building is the dining hall, kitchen and store house. Surrounding these two buildings and enclosing an area of about one-fifth of an acre is a six-strand barbed wire fence. Just outside of this fence at opposite corners armed guards are stationed during the day. At night the only guards are within the bunk house. The sleeping houses for the superintendent, steward and guards are a little distant from the enclosed area. The food supplied to the prisoners is the same quality as that supplied the guards and the steward. It is necessary that pure, wholesome food; clean and well-cooked should be furnished to prisoners, and that is what this camp tries to do.

In a camp of this sort, the men have free run of the building and of the area within the fence during the daytime. We give our men at the present time one week out of every four for good work. As yet we have not been able to arrange to give them any per diem for the work they do, but we, not only in North Carolina, but I think in every State throughout the whole country, are beginning to realize that the work of a State in regard to its convicts is not simply to get work out of them but to make them men capable of becoming good citizens when their sentence is over, and that is the plan we are trying to work on in connection with the work of the convicts in North Carolina. In Virginia and in certain parts of North Carolina, we have men who formerly worked on the roads and who are now foremen in charge of free labor in building roads. In other parts of Virginia and North Carolina we have other men now employed by farmers who watched them at work on public roads and kept track of them when their sentence was over and who came and offered them positions to go with them and work on the farm because they knew they were good laborers. The idea is to build them up and make them men capable of becoming citizens of the community after their sentence has expired, and we believe that is one function of the State with regard to the treatment of its convicts. We believe that the best solution of the convict problem is to work them, where they are able-bodied, on the public roads.

MR. SMITH (of New Jersey): I had occasion to visit a number of the camps in the South and talked with the men, and found that they feel they are being benefited morally, physically and mentally. Physically the convict is very much better off than in confinement and morally he is getting better; they are becoming good citizens, and more than that we are creating a nation of road builders through these convicts. When a man comes out of jail, usually he don't know what to do with himself, but now he has learned a trade while he is doing this work and has a good trade by which he can earn \$1.50 a day as a free laborer. Do you agree with that, Doctor?

THE CHAIRMAN: Yes, sir. Is there any further discussion?

MR. GASH: In Illinois we have just started to use convict labor on the construction of the public highways. We take the men out and put them on their honor and they have been working now something like a month, about forty-seven men, I believe at one place, and men who have been sentenced for serious crimes for a long term of years have been allowed to go with wagons far away from the camp by themselves and the men are all put upon their honor and not a convict has left or attempted to leave the camp. We are going to establish other camps throughout the State, and this, of course, will be extremely economical labor. It will not interfere with other labor in the least, but will be a means of constructing good



roads on an economical basis. If it was not so late, I might go ahead, but I think we ought to adjourn, we have been here long enough. I thank you.

THE CHAIRMAN: I will say in regard to Illinois, I have been very much gratified to get the report that I did a week ago regarding what was being done in Illinois, in working the State convicts on public roads. That is the ideal method of working convicts, putting the man on his honor. When I say putting him on his honor, I mean putting the convict on his honor. We have no guard whatever, no stripes and no man with a pistol in his pocket walking around among them to see that they do not escape.

MR. GASH: The chief thing about that is not only the getting of the good roads, but putting those men out there on their honor—and none have been allowed to go out except those whose sentences were less than five years or whose term of sentence expires within five years. I think that's a mistake; some of the best men for any kind of work that have never committed but one crime and that was murder, inadvertently it might be, in the opinion of the authorities would be the very best men to send out on this work, men who never would commit another crime if they were to get out of prison; but the chief benefit of all this thing, in addition to giving us good roads—that's a mere bagatelle—is that it gives to the men self-respect. The moment you put them out there, they have raised their heads and got their own self-respect, and when they leave the prison, they will leave there, not as criminals, because men are coming down there, manufacturers from Chicago and other cities, and saying to these men that they will give them employment when they get away from the prison, men that will go out on their honor and prove that they have some honor yet in life can get a good position after they come away from the prison; that is the chief benefit of this system to society. If you go into all the States—it will ultimately be the method of reforming those who are so unfortunate in life that they commit crimes and are sent to the various penal institutions of our country. I thank you.

THE CHAIRMAN: The next paper is "California's \$18,000,000 State Highway System," by Austin B. Fletcher, State Highway Engineer of California.

## CALIFORNIA'S \$18,000,000 STATE HIGHWAY SYSTEM

BY AUSTIN B. FLETCHER, M.Am.Soc.C.E.

*State Highway Engineer of California*

The sum of \$18,000,000 for a State highway system seems huge, but California is a huge State. Its area is 158,360 square miles, and from the Oregon State line on the north to the Mexican border on the south the shortest line that can be drawn is more than 700 miles long.

In their usual optimistic and expansive way, the people having decided in the year 1910 that they wanted a system of State highways, the State was bonded by a referendum vote in an amount which they thought would be enough to build a complete system, and they put no limit on the sum which should be expended in a single year.

### ORGANIZATION

The legislature of 1911 passed an enabling act, and in the fall of that year the work was organized and placed in charge of Messrs. Burton A. Towne, Charles D. Blaney, and Newell D. Darlington, constituting the California highway commission, and the writer was appointed to be the highway engineer. Overseeing the work of the commission is an advisory board of which His Excellency, Hiram W. Johnson, Governor, is the head.

The highway engineer was made the executive officer of the commission, corresponding in his relations to the different departments of the commission to the general manager of a large private corporation. Without reference to the public character of this work, the plan of dividing responsibility is along the same lines as if this commission were a private corporation engaged in the business of building roads. The highway engineer has directly responsible to him the following divisions or departments of the work:

### ENGINEERING DEPARTMENT

Which is under the working supervision of the assistant highway engineer. The work of this department is divided into eight subdivisions; namely, the headquarters, the division numbers, I, II, III, IV, V, VI, and VII, which represent the headquarters of work in the different parts of the state. Each one of these divisions is in charge of a division engineer, reporting directly to the headquarters office.

### PURCHASING DEPARTMENT

Reporting directly to the highway engineer is the purchasing department, which is in charge of all purchases, materials, equipment, etc., and which also has control and direction of the traffic work when the department is transferring materials and equipment from one place to another.



## ACCOUNTING DEPARTMENT

Reporting directly to the highway engineer is the accounting department, which is responsible for the records and accounts of the commission. The work of this department is transacted chiefly in the headquarters office, building up from records and reports sent in from the division offices.

## FINANCE AND DISBURSING DEPARTMENT

This department reports directly to the highway engineer, and is responsible for the disbursing of all moneys from both the headquarters and division offices.

## LEGAL DEPARTMENT

This department reports directly to the highway engineer, and handles all matters in which legal rulings are involved, such as decisions on legal problems that are constantly confronting the highway engineer, and such matters as rights of way, condemnation suits, etc.

The following table shows, classified, the employees of the commission on August 15, 1913.

	HEAD- QUAR- TERS	I	II	III	IV	V	VI	VII	TOTAL
Secretary.....	1								1
Assistant secretary.....	1								1
First assistant highway engineer.....	1								1
Second assistant highway engineer..	1								1
Office engineer.....	1								1
Attorney.....	1								1
Chief accountant.....	1								1
Purchasing agent.....	1								1
Geologist.....	1								1
Division engineer.....		1	1	1	1	1	1	1	7
Resident engineer.....		3		4	6	1	3	4	21
Assistant resident engineer.....		3		4	19	1	7	2	36
Right of way agent.....	1				1				2
Accountants and clerks.....	3	1	1	1	1	1	1	1	10
Stenographers.....	5				1	1	1	1	9
Typist.....	1								1
Messenger.....	1								1
Testing engineer.....	1								1
Laboratory assistant.....	1								1
Asphalt inspector.....					1				1
Blue printer.....	1								1
Draftsmen and computers.....	3	6	7	9	9	5	3	12	54
Chiefs of party.....		2	3	2	1	3		4	15
Instrument men.....		4	3	2	1			4	14
Rodmen.....		9	6	4	3	3	1	13	39
Axmen.....		15	1	3	1			4	24
Teamsters.....			4			1	1	5	11
Cooks.....		3	4					4	11
Totals.....	26	48	31	31	46	18	19	56	275

*On day labor work*

	IV	VII	TOTAL
Superintendent.....	2		2
Timekeeper.....	3		3
Foreman.....	14	2	16
Enginemen.....	8	1	10
Carpenters.....	6		6
Teamsters.....	41	1	42
Laborers.....	152	5	157
Water boy.....	1		1
Cooks.....		1	1
Total.....	227	10	237

## LOCATING THE ROUTES

Eighteen million dollars did not look so large after the commission had made an examination into the requirements of the "State highways" act and the needs of the State, and it was soon understood that the system could not be so expensive as many people expected.

The act, undoubtedly, contemplates, first, the construction of two main or trunk roads, one along the coast and the other traversing the great Sacramento and San Joaquin Valleys; and, second, that the county seats of such counties as lie east and west of the trunk lines shall be connected to the trunk lines by lateral and tributary highways.

The object of the statute, in so far as the two trunk lines are concerned, is by directness to afford a means of communication so that the people of the north may be in touch with the people of the south in the shortest interval of time and space, and at the same time linking together those county seats and centers of population which can practicably, and without materially sacrificing directness, be so joined in a trunk line running north and south through the State.

The laterals are provided for in "State highways" act for the express purpose of furnishing ingress and egress to and from the trunk lines for such county seats as can not practicably be reached by a direct trunk line; and that the ultimate scheme of the State highway system is to cover the State of California with a net work of highways which will compact the whole State for the purpose of intercommunication of the residents of every part of the State, and so that no longer will counties be spoken of as being "remote or inaccessible."

It will thus be seen that the State highway of California under the present legislation at least, will be but the skeleton for the road system of the State, and that local county needs are to be supplied by county systems.

These county systems are being rapidly provided for, and it is no exaggeration to say that before the State highway system is complete the counties will have provided for an expenditure of more than double the \$18,000,000 which the State will spend.



## LENGTH OF SYSTEM

It was found that to comply with the terms of the act not less than 2760 miles of road must be taken into the system, which means that the average cost per mile of road built must not exceed about \$6500, including expenses of administration. Since this sum per mile is nearly \$5000 per mile less than some of the eastern States are paying for their State highways, it follows that relatively cheap roads must be built in some parts of the State, and that it will not be possible to pave the surfaces of all the roads.

After months of study the following allotment of the fund was agreed upon tentatively:

*Trunk lines*

1305 miles, requiring paving, at \$8,620.....	\$11,249,246.00
480 miles surfaced with local materials, at \$5944.....	2,852,905.00

*Laterals*

785 miles at \$2,881.....	2,261,485.00
Already improved county roads, 190 miles, at 0.....	
Add 10 per cent for administration, surveys and engineering.....	1,636,364.00
Total bond issue.....	\$18,000,000.00

Fortunately nearly every county in the State has agreed to build and pay for the bridges along the State highway routes, and to furnish without cost to the State all land needed for the locations of the State roads. In total such donations amount to many hundreds of thousands of dollars.

Without this county assistance and without the extremely low rate for the haulage of materials which the railroads have granted, the task of completing the system with the sum of \$18,000,000 would have been hopeless indeed.

## TYPES OF WORK

For a large portion of the roads the commission has adopted a pavement consisting of a Portland cement concrete base of a minimum thickness of 4 inches and 15 feet wide with shoulders at least 3 feet wide on each side of the concrete. The concrete base is covered with a thin coating of asphaltic oil of special quality and stone screenings, forming a bituminous carpet from  $\frac{3}{8}$  to  $\frac{1}{2}$  inch in thickness to serve as a wearing surface and to protect the concrete.

An effort is made in every instance to adjust the type of road to fit the needs of the traffic, and no arbitrary standard has been or is likely to be followed.

While the bulk of the mileage now under contract is being built as described above, in the environs of San Francisco and elsewhere thicker bases and thicker wearing surfaces are specified.

In every case the roads are being carefully graded and the drainage is given much study. Briefly stated, the commission has been guided by the following general principles:

1. A re-adjustment of the road locations or rights of way so as to secure proper alignment, and to obviate the necessity for traveling around section corners.
2. Rights of way uniform width, preferably not less than sixty feet.
3. Maximum gradients in the mountainous country of 7 per cent and minimum radii on the center lines of such roads of 50 feet, with all curves opened out as much as possible by flattening slopes and removing brush and such trees as interfere with the view. A clear sight of at least 150 feet should be secured wherever it is practicable.
4. The construction of permanent culverts, gutters and ditches wherever they are needed to prevent water from standing on the roadsides and on grades to prevent gullying due to the water being carried too far in the gutter and thus accumulating in volume.
5. The construction of bridges of a permanent character, preferably of reinforced concrete, such bridges to be at least 21 feet wide in the clear, and so designed that they will carry 16 ton traction engines with a reasonable factor of safety.
6. A minimum width of roadway of 16 feet, which may be travelled safely, such width to apply only to those places in the mountains where there is so much rock as to make a greater width prohibitive on account of its cost. An average width throughout the remainder of the State of 24 feet on embankments, of 21 feet in through cuts and 22½ feet where the road is part cut and part fill.
7. A crown or cross-camber varying from 1 inch to the foot where no surfacing is applied to less than  $\frac{3}{8}$  inch where bituminous surfaces are used, in all cases the crown to be the least needed to cause the water to run quickly from the road into the gutters.
8. Such type of surfacing as the needs of the locality require varying from the graded road to the highest type of asphalt paving and varying in width from 15 to 24 feet.
9. The erection of guard rails at dangerous points on grades and on high embankments.
10. The proper trimming of slopes along the road sides, both old and new, so as to prevent the unsightly gashes now so noticeable along the roads. Also the planting of suitable trees, indigenous to the locality, and properly caring for them.
11. The placing of proper permanent monuments at the time of construction along the roads to mark accurately the limits of the right of way. Also the erection and maintenance of guide boards marked to show places and distances accurately.

#### PAVING COSTS, ETC.

The following table shows the different kinds of paving which the commission had under contract August 1, 1913, together with the lengths and costs. The figures do not include the costs of grading, culverts, etc., nor do they include the expenses of administration.



	MILES	COST PER MILE	COST PER SQUARE YARD
Asphalt on concrete base.....	6.6	\$14,920	\$1.06
Asphalt on macadam base.....	11.5	8,403	0.716
Three-eighths inch surface on concrete base....	198.1	6,394	0.712
Bituminous macadam.....	19.1	6,364	0.723
Waterbound macadam.....	7.6	4,303	0.489

## THE THIN ROADS

As will be noted in the foregoing table nearly 200 miles of the State highway is being constructed with a  $\frac{3}{8}$ -inch wearing surface on a concrete base.

The specifications for this kind of work provide that the base shall be of a minimum thickness of 4 inches, but discretion is given to the highway engineer to increase the thickness of the base whenever he considers a greater depth of concrete to be desirable.

A base so thin as this would not met the approval of the writer for use in many parts of the country, but in the moderate climate of those parts of California where the work is now under way it will doubtless be adequate for all time. Great care is employed in securing a rigid sub-grade and an effort is made to secure a high grade of concrete.

The concrete is laid without "expansion" joints. It is observed that at intervals of about 30 feet natural contraction cracks develop. These cracks are filled with heavy bituminous material as soon as they are wide enough to receive it. It is believed that with the thin wearing surface it is much better policy to omit the artificially made joints and that the road surface will be much smoother to ride upon because of such omission.

Some objection has been made, chiefly by certain not disinterested contractors, to the thin bituminous wearing surfaces adopted in so many instances by the commission. Derisively, but perhaps not inaptly, they have called the roads "painted concrete."

These contractors insisted that the asphaltic surfaces should be not less than 2 inches in thickness, and that they should consist either of sheet asphalt or one of the "bitulithic" variants. Were it considered desirable to adopt their suggestions, there is not money enough in the appropriation to complete but a small part of the system in that manner and do justice at the same time to the remainder of the State, and the commission has concluded to continue with the thin surface, renewing it so often as is necessary. The thick surfaces would cost more than ten times as much as the thin originally, and it seems probable that the interest on the excess cost of the thick surface over the cost of the thin will pay all of the cost of renewing the thin wearing surface as often as it needs it.

Some of the so-called "painted concrete" has been under traffic about eight months, with a complete satisfaction of all requirements.

## MAINTENANCE

The "State highways" act provides that the State highways shall be maintained by the State, and no provision is made for the sharing of the burden by the counties.

To provide the money for the purpose the legislature of 1913 passed a new law relative to the operation of automobiles, one feature of which sets up a system of graded fees for the annual registration of motor vehicles. By the first of January, 1914, when the act takes effect, there will be not less than 100,000 motor vehicles in operation on the highways, and the total fees received will doubtless be in excess of \$1,000,000 for the year 1914. After the expenses of the registering department are deducted, one-half of the remainder goes to a fund for the maintenance of the State highways, the other half being appropriated for the maintenance of county roads. Thus, for the year 1914, it is estimated that more than \$450,000 will be available for the upkeep of the State highways.

## PROGRESS OF THE WORK

At this date most of the surveying work has been accomplished on the trunk lines. The laterals also have received due attention, and within a few months all of the surveys preliminary to letting contracts will be complete.

Nearly all of the construction now in progress has been let on the contract basis, but because of the failure of several of the contractors the commission has taken over the contracts in such cases, and those roads are being completed by day labor.

The writer had confidently expected that by this date more than 500 miles of the system would be under contract, but the financial conditions of the country have prevented. The California State highway bonds pay but 4 per cent, and they may not be sold at less than their par value. For some months the bond buyers have looked askance at State bonds paying so little, and although the local bankers have, in a most public-spirited manner, subscribed for more than \$2,000,000, the work of the commission has been handicapped seriously. The total amount of the bonds sold to date is \$4,700,000.

In any event, California will have many miles of the State highway to show her guests who come in 1915 to the exposition at San Francisco and San Diego.

## DIRT ROADS AND POLITICS

October 1, 8 p.m.

BY CHARLES P. LIGHT

I am more than glad to see all of you who are here tonight, and I feel that those who are not here will have missed an evening's entertainment that they will regret. I simply want to have your atten-



tion for ten or fifteen minutes while I sort of start this thing off and get you in a receptive frame of mind for Mr. Warren and the pictures that will be shown on this screen tonight, and I want to talk seriously to you a little while, because this Road Congress that is here has met for a purpose, and I want to say to you gentlemen who are in this hall now and who have come here and made this Congress, by your presence, one of the greatest that has ever been held in the world's history. I want to say to you men who are here and who have taken part in the exhibition end of it, you have given to the people who have attended this Congress one of the greatest expositions ever given and it is worth a lot of money to those people who have come here who are road supervisors or city or county engineers or have any official position. You have a commercial interest in it, you are not giving the Congress. The American Highway Association, the American Automobile Association, the Michigan State Good Roads Association and the two dozen other associations associated with them are giving the Congress, but we could not have the Congress without an exhibition of machinery.

My subject here tonight is "Earth Roads and Politics," and the point I want to make is the effect of partisan politics on road conditions or legislative conditions that pertain to road matters in the country. There is not a man in this room who has paid any attention whatever to highway conditions in this country with reference to men who are employed either as State highway commissioners, engineers or in any other position down the line, that has not been affected or who has not realized the baneful effect partisan politics have on various State highway departments as well as local departments. The American Highway Association was organized three years ago and it had two distinctive objects in view, first to see that efficient men were put in charge of the expenditure of road and street funds, especially road funds in the country, and second, that the men in charge should be removed, as far as possible, from political influence. We are not advocating any one kind of road or any road from one place to another; those things will take care of themselves, when we realize that in this country we are wasting, through inefficient systems in the various States and counties, about \$40,000,000 a year. In other words, we have heard a good deal of talk about the Lincoln Highway and the Highway from Dakota to Texas that Mr. Nickerson is interested in; we have heard about the Miami-Quebec Highway. We are wasting enough money annually in this country through having inefficient men in charge of the work or by changing the various departments every now and then, to build the Lincoln Highway and a road half way across this country north and south. This matter is a great economic one and the people of the country are awakening to it in every State. There is more interest in it today than ever before in the country, not only in the United States but in Canada. Just think of it, and I am not casting any aspersions on any man here tonight, but think of what is

happening in the great State of New York; they have changed the heads of the highway department in the State of New York three times in the last four years. Think of it, a great State like New York! Colonel Sohler said last year at the American Road Congress, that the most valuable thing in a highway department was tenure of office, that he had men in his department who had been there fifteen or seventeen years. You take a great railroad—George Panell of the Baltimore and Ohio Railroad, is in this room, and Mr. Richardson, of the Southern Railway; take old Tom Fitzgerald, who was with the Baltimore and Ohio for forty years—why wasn't he fired when Grover Cleveland was elected, and why wasn't somebody else fired who succeeded him when McKinley was elected? It is absurd, it is foolish, and I don't see why the business men of the country will permit this thing; I don't see why they don't unite and do so in the near future, and stop this thing of upsetting a highway department simply because Teddy or Woodrow or Bill is put in. Have an efficient man and keep him there. We have got to take these things to heart and think about the cost. It is costing us a lot of money in the country. There are highway commissioners today in this country who are good men, and I know them and some of you know them, and they don't know today how secure their positions are. It means this, that our engineering schools are turning out men who are not taking highway engineering seriously, because they have no assurance that the positions they get will be at all secure. I want to tell you frankly that it is hard to get today an efficient engineer for a State highway department; I know that, and the time is coming when the office of State highway engineer will be regarded as one of the most honorable and important of any in the State. I come from a State that I am proud of and our motto is *Montani semper liberi*—the State of West Virginia—some of my people are here tonight, but I want to tell you frankly that in the county where I was born and where my people have lived for 170 years, the county changed politics and the complexion of the county court changed at the last election and the man who was county engineer was turned out of office today and two other men who voted the other ticket, were put into office. The objection was raised two years ago that that office was not necessary, and now there are two men drawing \$1900 a year, whereas that man only drew \$700 a year. The man who was fired today ought to have been kept, because he knew about the roads in the county. Take Sam Rice; he has charge of the right of way for the Richmond, Fredericksburg and Potomac Railroad, running from Washington to Richmond, and he told Mr. Page, the president of this Congress, and myself, two years ago, that he had been with the Richmond, Fredericksburg and Potomac Road since 1867, that's forty-six years ago, and as we stood on the back end of a train going to Richmond, he said "I know every crosstie on this road." Of course he was valuable to them. We ought to take it out of politics, absolutely take it out of politics. Now, there



is another thing, a man is never going to make a success of anything nor will he be successful in life unless he believes in what he is doing. I belong to a church that teaches a young man when he enters the seminary, that teaches that young man this one thing the first year—the man that enters the seminary to study for the ministry—experimental religion; in other words, our idea being that a man must first realize a thing, appreciate it himself before he can teach it to others, and as the president of that institution told me once lately, a man has got to burn before he can shine. You will never get any more out of a thing than you put into it, don't forget that you have got to put your life into this thing. A man went to a church to preach for another minister one night and he knew the sexton well, an old man who had lived for a long time in that community. This man used to live there, and after service was over, he talked to the sexton—he had a little girl with him about eight years old, she went back to the door and was looking at a box while her father was talking to the sexton; finally he came to the door and Bessie was still looking at this box and the box had written on it "Contributions," and she said, "I can't make that out, what does it say?" He said, "It means contributions," and he gave her a nickel which she put in the box. The sexton came out about that time and said, "Dr. Smith, we have established a new practice in our congregation since you used to be here; instead of passing the plate, which sometimes embarrasses people because they don't like the one sitting next to them to see what they are giving, we cut out the plate and let every man, as he goes out the door, drop his contribution into the box and his left hand doesn't have to know what his right hand is doing, and whoever preaches here gets what is in the box. I have the key and will open the box and whatever is there is yours for preaching tonight." And he took the key and opened the box and in it there was this nickel and that's all there was in the box, and his little daughter Bessie said, "Father, if you had put more in the box, you would have got more out." That is absolutely true with everything in life, and you men know it. Now I am just as thoroughly convinced that the solving of the highway problems of our country is essential in order that the prophecy that is recorded in Amos and Isaiah—and every man in this room knows what Amos I am talking about and what Isaiah I am talking about, and it reads this way, "And they shall beat their swords into ploughshares and their spears into pruning hooks and they shall not learn war any more." What does that mean? It means the ultimate triumph of agriculture and you cannot have agriculture triumph in any country unless we have the very best transportation facilities it is possible for us to have. Why, this thing of paying 23 cents a ton a mile to haul stuff from the farms to this country to the nearest shipping station and have the average length of haul 9.5 or 9.4 miles. In other words, when we have to put up \$2.16 a ton for each ton hauled on an average in this country, as against \$1.74 to ship that stuff from

that station to New York and then to Liverpool, think how much we are paying for transportation over our roads. We have got to consider those things, we must do it, there is no escape from it. This Congress is going to have a great effect on the country, for this reason, and I want the men who are here representing the various trade and technical papers to hear me; there never has been a meeting of this kind held anywhere, where as many technical and trades papers and agricultural papers are represented and where the results of this meeting will have the circulation among the people who ought to have it, that this meeting will have. I am not going to take any more of your time, because Mr. Warren is here, and I simply want to close by saying this—if you fellows have had as good a time at this meeting as I have had, you have had a corking good time. I thank you very much.



## ROAD USERS SESSION

October 2, 10 a.m.

UNDER AUSPICES AMERICAN AUTOMOBILE ASSOCIATION

GEORGE C. DIEHL, Chairman

THE CHAIRMAN: Before introducing the chairman of the morning, there are two gentlemen here from Canada whose company and hospitality many of us have enjoyed, and it is desired that before they return to Canada, that they say one or two words to us regarding a subject which they wish to bring to the attention of the convention, and it gives me a great deal of pleasure to present, first, Mr. Magrath the chairman of the special highway commission of the Province of Ontario.

### ADDRESS BY MR. C. A. MAGRATH

*Chairman Special Highway Commission of Ontario*

I am being presented in the wrong order; my friend, Mr. Campbell who represents Canada, should, in my judgment, be asked to speak first. However, he has insisted that I, as representing the highway commission of Ontario, should address you for a moment or two. We realize that your program is very full, that it is going to take all the time available to get through the subject to be discussed, but I feel personally that I cannot return to Canada without saying how deeply we appreciate the treatment we have received at your hands, and I wish to publicly acknowledge before you our indebtedness, as a commission, to Mr. Carlisle and his associates from the State of New York. We had the pleasure of going to Albany a few days ago, and there is no place on earth that we could go to where we could possibly be better received than at the hands of these gentlemen, and it is due to him that a public acknowledgment should be made on behalf of Ontario. It gives me very great pleasure to do so. Now we are neighbors and we are interested in good roads and I realize that you must be just as much interested in our work as you are in your respective States. I suppose, sir, the greatest compliment that can be paid to any man is to ask him into your home life, into your home and we want to put before you that idea, that you keep in view, probably the year after next, the idea of coming to Canada, to our home, where we hope we will treat you in such a way that you will want to continue to come there. As a matter of fact, there are many of us in Canada who hold the opinion that you

are better Canadians than those born in the country, at least so far as activities in western Canada are concerned. I feel personally that your people are doing more to build up our great country than many of our own; therefore that is practically all I have to say to you gentlemen this morning, that we sincerely hope that you will allow us next year to put before you, in a serious way, an invitation to come either to our national capital, Ottawa, or, say, the city of Toronto, to the capital of the province of Ontario. The question of good roads I am not going to discuss now; you have too much to think of, we like you because of that, and in leaving you, we insist that you must come to Canada and hold a meeting.

THE CHAIRMAN: Mr. Magrath has stated that the Americans are to some extent building up Canada, more than the Canadians themselves. It is a fact that there are one or two Canadians who have done as much to help the road movement in the United States as any American road enthusiast. One of those Canadians who has done that is the next speaker, he has spoken as many times on good roads as many of the good roads men here. The subject has been dear to his heart, he has given it careful study, and the people of the Dominion of Canada and the Province of Ontario have appreciated his great labors in that direction and made him the minister of public works. As many of you have heard him, it is hardly fitting for me to introduce him, as you all know him better than you know me, and I call on the Honorable Mr. Campbell as the next speaker.

### ADDRESS BY MR. A. W. CAMPBELL

#### *Minister of Public Works*

I just come forward for perhaps a few words by way of seconding the suggestion that has been made by Mr. Magrath. Now I might say that in the Province of Ontario, as in some of your States, the question of the desirability of good roads has been settled. The provincial legislature has appropriated \$5,000,000 to be expended in connection with the work of road improvement to aid the different municipalities in carrying on that work, but how best to make that expenditure of course is a very great question. The money is there, they want to spend it, but they don't want to waste it and they want to see that every dollar that has been expended or appropriated will be expended so as to produce a dollar's worth of results. Now, for that purpose, Mr. Magrath and his commission have been appointed by the legislature to frame the most desirable plan that can be laid down to govern that expenditure, and that expenditure will be made under the direction and supervision of this commission, outside of any other influence whatever. We do believe that when this commission makes its report, that these recommendations will be of



such a character as to assure that even better roads will be built in the province of Ontario than are now being built in the adjoining States of New York and Massachusetts, from which we have taken so many lessons. New York I suppose has been, and Massachusetts has been a pioneer in this direction, and we watch every mile of road, you might say, that they build. We study how they build it, what the result is, and then we try to avoid some of the mistakes which they have made, and in that way we receive a very great deal of benefit from the very free information that is always given gratuitously by Mr. Diehl and his commission. Certainly we do admire the work that has been done there and we watch them closely. Now then, when this commission has made its report, we expect in the province of Ontario, that that money will be so expended as to make some of the most up-to-date roads on the continent of America. Now the Dominion government is willing, as soon as the provinces are in a position to handle the expenditure fairly, to make an appropriation there, and we do not question how many millions it is going to take, we are not thinking about that at all; what we want is a competent plan for the expenditure of the money and then we will make State roads and National roads and good roads. We are working at this and we now have many miles of very good roads. We have one or two cities over there that are bright, prosperous, live cities, with all the accommodation that is necessary, almost equal to that of Detroit for entertaining a congress such as this. Geographically we are favorably situated, and we came here designing to capture this convention, if possible, and bring it to Canada next year, and if it is possible, to affiliate ourselves with you so as to absorb some of the extremely valuable information which is disseminated at these meetings, but we find that there is already on foot a very live, healthy, active campaign among one or two of your cities for the convention next year; consequently we think we are defeated and we are going to give you advance notice that at the next annual meeting of your congress, we are going to make a more strenuous fight to have the congress held in 1915 either in the city of Toronto or the city of Ottawa, where we will give you a right royal good welcome, a good time, and possibly give you or assist in giving you some information that will lead to the betterment of your roads and our roads.

THE CHAIRMAN: I am sure that if we could put the question now we would all vote to go to Canada. The only trouble would be, I warn the honorable minister, if he ever gets us there, he will have hard work getting rid of us; we are apt to stay a month; I know, because I have been there before. You all know that New York is spending more money for highway improvement than any other State in the United States, or I think I am safe in saying, it is spending more and has more to expend than any country in the world. There are results in New York of which we are proud and

others of which we are not proud. The reason for some of the failures has been the frequent changes in office by reason of frequent changes in State control. The State started the road work fifteen years ago, and since that time there have been nine changes in administration. When the present executive of New York was elected, he looked all over the State to find a man to put at the head of the highway department whose standing would insure to the people of New York an efficient and economical and wise expenditure of public money. The scandal resulting from mal-administration had so forced the good roads question into the public eye that the people were aroused as never before to the importance of the work of the State highway department, and the governor selected a gentleman who had been known for years as a public spirited and patriotic, a live and energetic man who, in the northern section of the State, was looked upon as the one best versed in public affairs, and it was to the great satisfaction of all the people throughout the State that he selected a man who was so good an executive and so careful in his methods as to insure a proper expenditure of the highway funds. It is with some little embarrassment that I speak in these glowing terms of the chairman, as he once in a while allows himself to be controlled by friendship rather than by sound business principles, and when he appointed Colonel Washington, the handsome gentleman at my rear, and myself on the advisory board, he committed one of these errors of judgment and acts of friendship, and I do not want anybody to think that I am returning it by trying to say something about Mr. Carlisle; because he deserves all I can say of him and a great deal more, and it is a great pleasure to present, as the chairman of the morning, the Hon. John N. Carlisle, chairman of the commission of highways of the State of New York.

### ADDRESS BY JOHN N. CARLISLE

#### *Chairman Commission of Highways of New York*

When we have completed in New York State the type of roads we are going to build and open up to the people of this world the possibility of their being able to come to our State and take in all these diversified scenic effects, there is no doubt but what we are not yet able to appreciate the wonderful, tremendous influx of travelers that will come into New York State. Next year, by December 31, 1914, we expect and I believe we will be able to complete practically the great through routes of New York State, so that you gentlemen from the west can come into New York, can go to Buffalo, from there you can go through the cities of Rochester, Utica and Albany, down the Hudson River to New York, or you can turn and go by Lake George and Lake Champlain to Rouse's Point into Canada, if you desire and come back down to the Great Lakes and Buffalo, or you can take route No. 4, and, by an entirely different route from



what you came from the west going east, you can go back through the entire length of our State. Now these problems in New York State, as you see, are very hard problems to solve but very interesting, because of the different types of roads that we have to construct. We have the ocean sands on Long Island that call for one particular type of road. We have near there the largest city in the United States with a tremendous automobile traffic that comes out of that city, passing over those roads. We have, in northern New York, our heavy clays and in the southern sections our shales. We have tremendous valleys where but one road can pass through, where we cannot build full width roads, and we have our mountain sections, where we have to climb them by divers routes in order to get up through those mountain passes; so in the State we are in a different situation, somewhat, from what you gentlemen are in the western States where you have a flat country and the same kind of soil all over the State. We are confronted with every condition of soil and different characters of roads and great climatic changes. The southern part of our State is, in a way, remarkably mild; the northern part has very severe winters, and to design roads which will stand up is a very great problem to solve. When I was appointed, I determined that if there was any way in the world we could solve this problem before we started again on the expenditure of this large amount of money, we would try and solve it in an intelligent way. The legislature in 1913 had changed the law, abolishing what was then a commission in New York, and provided for a single headed commissioner and to put upon one man the expenditure of this large amount of money, was a proposition that would make any man tremble to tackle it, and I insisted on the appointment of an advisory board of engineers that would take up with me these problems, and I think I was very fortunate in the board. I got Mr. Diehl, who had been county superintendent of Erie County for a good many years. It didn't make any difference whether the board of supervisors was democratic or republican, they always took Diehl. I went to Massachusetts and got Mr. Parker and I got Colonel Washington, of New York, and we started to go out over New York State from one end to the other to try and study the problems relating to our State so that we would know, in each section, what we were up against, what confronted us with regard to problems of traffic, what type of roads we ought to build, taking into consideration the locality, the material available for constructing roads in those localities and the probable demands upon those roads in the near future in connection with the traffic which is bound to come upon good roads the minute you complete them and open them up and this advisory board has been working all summer long. When I get back to Albany, I expect to get their report and know that every single man here will be interested in it, because in that report we are trying to work out practically an entire reorganization of the highway department of the State of New York to put it upon a

plane of efficiency that we think and hope will result in our being able to solve the problems in our State. Today New York State has 4000 miles of improved roads, already built. These roads were constructed a number of years ago, some of them; they were constructed when nobody anticipated the traffic they now have to bear, and it is a problem, not only of the maintenance of those 4000 miles of road, but the great problem is that we have to rebuild a good many miles of roads because the roads were built several years ago and what was then a proper type of construction will not stand up now, and to show you where the maintenance problem comes in, the highway department, in order to maintain 4000 miles of roads in New York State, asked the legislature last year for \$7,000,000 to take care of maintenance alone. They gave us \$3,500,000 for maintenance on those roads in New York State, and that amount is not sufficient to properly maintain those roads to the degree of efficiency we desire, and take care of the rebuilding of some that have absolutely gone to pieces and are now in a shape where we cannot repair them and any attempt to do so would simply be foolish. We are now building 1600 miles of roads in New York State outside of the 4000 miles already in construction. Those contracts involve \$20,000,000 and our payments to contractors in this month for construction work in New York State in the month of August amounted to over \$2,700,000. The payroll of the department in the State of New York is over \$1,200,000, and besides that we are paying out to the poor towns, to help them in building their town highways, over \$2,000,000 so that the problems that relate to New York State are problems that are so vast that I knew I was justified in the appointment of an advisory board and I know I am going to be justified in the entire reorganization of the department from beginning to end. In our State, under the old law, we had six divisions with a division engineer in charge of each division. Our maintenance was separate from our construction; a different force handled maintenance and construction. Under our proposed scheme, we are going to have nine divisions in New York State, each division of which will be larger than the State of Massachusetts, and spending more money in construction in the next ten years, and in maintenance than many States do, so you can imagine the problems that confront a division engineer in New York State with the building and upkeep of these good roads. We are not afraid of construction; we think we are going to be able to build types of roads, taking into consideration what science has taught us up to date in regard to road-building; the great trouble is maintenance, to keep those roads up to a proper degree of efficiency, and when New York gets through building its system of 12,000 miles of roads, the maintenance problem will be a very important one and it must be studied now to see to it that when we spend this enormous amount of money in building these roads, we don't let them go down to where they will be a disgrace. Today the people demand efficiency; they demand of



those who hold public office and have charge of public work, that that work shall be done efficiently. Now, our system in New York is somewhat unique, and I think a good many of you gentlemen here who have been talking about the problems and the way to handle roads—possibly we may have figured out a pretty fair scheme in connection with it. We first have a system of 4000 miles approximately, of State roads that were laid out by the legislature of New York State, and under the last referendum, that particular 4000 miles, 3800 and some miles, must be built as laid out on the map. We build those roads, pay every dollar of the cost of building them and of maintaining them, so we have on our map, as we call it, our State routes numbering 4000 miles, then we have a system of what we call county highways, and these are roads laid out by the boards of supervisors of each county in the State, for the department at Albany has the veto power as to whether or not they lay out a proper system of connecting roads. Thus county highways of 8000 miles are built in the same way as the State routes, that is the departments at Albany builds the roads and maintains them, but the counties pay a part of the cost of building those roads, and that cost runs from 35 per cent down to 9 per cent, and the difference in the cost which the county pays toward the building of a county highway depends upon the population of that county in connection with its area and mileage, so that in all the counties of our State where we have a city, the county pays 35 per cent of the cost of building those county highways, and in counties where there are no cities and the population is small and the assessed valuation is light, it varies until in one county, Sullivan, the State pays 91 per cent of the cost of building the highways of Sullivan County and the county pays 9 per cent. This county money is paid by the county as a whole, not assessed upon the towns or individuals, but the county itself raises its share of the money to build this system of county roads, and we maintain and build the roads exactly in the same way and by the same men as our State roads, and in regard to maintenance, the towns in which the highways are located, pay \$50 per mile per year for maintenance, which is a mere bagatelle so far as the cost is concerned, at the present time. Besides that, we give directly to the towns themselves this year \$1,781,000 of money. In this way, if a town raises \$1500 of money to improve its town roads outside of these county and State highways, the State of New York pays directly to the town board \$1500 and duplicates their money. There is a divergency there. If a town is a rich town with a small population, we don't give them as large a percentage of money as we do a poor town with a large population, but it practically means that every one of our towns in New York State, the State, by means of a direct payment out of its treasury, duplicates the money that the town raises for good roads, and because of the fact that we duplicate the money that the town raises, we have, in a way, a supervisory scheme of looking after the distribution of that money in the towns.

We have a department under the charge of a deputy known as the bureau of town highways, who travels around the State with a corps of inspectors, advising the county or town superintendents as to the proper methods of taking care of their purely town highways and bridges and culverts, and I want to say there has probably been no better work done in New York State today than has been done in the last five or ten years among the poor towns of the counties and in the typical cross roads towns of New York State by means of supervisory work done by county superintendents under the supervision of the department at Albany and by the helping of these poor towns by a direct giving of money to them for improving their roads. This money is paid directly to the supervisors of the town and the town board can disburse it in the building of roads, bridges, culverts or any other method they want to adopt, so you see the activities of the highway department of New York reach out to and cover every road in the State of New York, and our mileage there is about 80,000 miles. In regard to bridges, a wonderful development has taken place there. You all know the bridge game in the past. I know one town alone, when I went with the third deputy, there was a bridge 135 feet long built seven or eight years ago, and we took care of it by seven-foot culverts. Under the law today, no town can buy a bridge unless the county superintendent at least approves it, so we have got some kind of a check in New York State upon the policy of building these tremendous bridges over streams where they are absolutely not required at all. In addition, if any town wants a bridge built and they apply to our department, we will prepare the plans and specifications without charge and furnish them either for the building of a culvert of concrete or a steel structure, so we have tried to work out in New York, and I think fairly well, not only the scheme of taking care of what a good many people criticize as the building of roads simply for the automobile and the rich man, but we have gotten up a scheme that reaches right down to and gets upon every road in our State, no matter how small it is or how poor a section it is located in, and in some way try to get them to improve their local town roads in the backwood, as we call them. Now we have also located at Albany, and I think that is an important thing for you gentlemen to take up, a bureau of tests whereby not one particle of material can go upon a road in our State until that material is tested in our department at Albany by our own men. No tar, no asphalt, no cement, no stone, no sand, nothing whatever of any possible nature, gravel or anything else can go upon our roads until that material is tested in our own department at Albany by our own men under our own supervision, and I want to assure you that it is a wonderful advance in regard to road building when you know that the materials that go on a road are materials that are going to last, or materials that are not going to pieces within a comparatively short time, and that is one of the most interesting subjects we have, and we are now having a man



travel our State from beginning to end who is doing nothing except looking into the problem in regard to materials for road construction, finding out every gravel bank there is, sending the material to Albany and having it tested, and there is not over half the gravel that will stand the test we require. Lots of gravel, when subjected to the test, will not stand up and we won't permit it to be used. We test all the sand and we are trying to locate all the stone quarries in New York that may possibly be made available for construction, so that we can tell our contractors "You can get this material at a certain place." We are trying to get options on these stone quarries and gravel pits, so they cannot be held up for any exorbitant price, and I submit to you gentlemen who have charge of State work, that one of the most important factors that you ought to get into, no matter how small you get into it, you ought to have at your headquarters some kind of a bureau of tests whereby you yourself know without taking anybody else's word for it, because this highway game has pretty nearly developed in a highwaymen's game in a good many sections of the country, and you have got to be careful and know that what you put into the road is what you want to put into it and not what somebody else wants you to put in because he's got something to sell. We have put that department on the basis of a very high degree of efficiency, and one of the greatest advantages is the knowledge that when we build our roads in the future, we are going to know, when we put any material into the road, that that is material that we believe will effectively do the work it is called upon to do. In our State, the maintenance problem, as I said before, is the great problem. We have tried to take care of it in the past by a patrol system, that is, we have assigned men an average of about five miles of road each. Those men go upon these roads; they have a horse and cart and are supposed to look after the road, but we became convinced that the patrol system does not bring the results which we want to have for the expenditure of that amount of money. Our patrol system in the State of New York this year cost us \$600,000, and I think we might as well have taken about \$500,000 of that money and dumped it in the river so far as results are concerned, and we are determined in the future to try and handle this question of maintenance on an entirely different basis, organize section gangs of men and try to follow the policies adopted by the steam and street railroads in the methods by which they keep their property up. They would never go back to a proposition of putting a man in charge of five miles of road and expect every man to have their lines kept up. We will organize section gangs and give them a steam roller, an automobile truck and any other equipment necessary to let them go on these roads and put them in the shape in which they ought to be maintained, and we believe in New York and are very hopeful that by means of the advice given us by the advisory board and the new specifications we expect to put in force within a week for the building of our roads in the future, we are going to be able,

we hope, to solve the problem a little bit better in New York, whereby we can build good roads, maintain them, keep them up to the proper degree of efficiency required by the people and try to give the people a dollar for every dollar that is spent.

(Mr. Carlisle then took the Chair.)

THE CHAIRMAN: I have the pleasure of introducing to you a distinguished citizen from the western part of the United States who has been interested all his life in good roads and who is going to speak to you upon the national old trail roads, Judge Lowe of Missouri.

### NATIONAL OLD TRAIL ROADS

BY JUDGE J. M. LOWE

I am almost always introduced and assigned to that subject and rarely ever touch upon it except incidentally by way of illustration. I ought not to be and seriously protested against being called upon this morning to again address this convention. I had the pleasure and the honor of addressing you the other day, the first day of the convention. I am on the program again tomorrow, Michigan day, and so I am liable to become stale and unprofitable; you will get tired of hearing one man talk too much; but as it is insisted upon, if you have the patience, I believe I have the nerve and the courage to talk to you for a few moments, and in the beginning I will supplement, for a purpose, the splendid address just delivered by your chairman, Mr. Carlisle. He was dealing only with one phase of the question, and that a practical one in the State of New York. He did not tell you, as I now tell you, that 80 per cent of the \$100,000,000, at his disposal in the State of New York is paid by the city of New York. I am saying that to my farmer friends. The time was in the history of road legislation, that the farmer was unduly burdened with road maintenance and road construction. In the evolution of events, that is no longer true and it ought not to be true. The cities, the towns and the villages are using the public roads now as they never did before, and they ought to help build and maintain them and they are doing it willingly so far as I know. New York first voted \$50,000,000 of bonds. There was some criticism on its expenditure and it was not sufficient. They submitted another \$50,000,000 proposition. The first \$50,000,000 was carried largely by the vote of New York City; the farmers pretty generally voted against it. Notwithstanding their experience, when it was submitted the second time it was carried almost unanimously. Now that \$50,000,000 bond proposition is pending in the State of Pennsylvania and I understand they have expressly exempted farmlands. That is wrong, absolutely wrong, if that is true. No kind of property



ought to be exempted from an equitable division of the burdens of taxation, especially for great internal improvements, but they will carry it, I hope, and expend it wisely. Now, in Missouri, where I come from, we submitted a proposition authorizing and empowering the county courts to levy 25 cents upon the \$100 of valuation to raise a road fund. Most of our people in the rural communities voted against it. I am a farmer myself and have a right to talk about it. We are naturally shy. I am not an automobile owner, either, and have a right to talk about them; I don't know whether I ever will be an automobile owner or not. I am not connected in any way, shape or form with any commercial interest under the sun, and never have been, so that I am a free lance on all these questions and can afford to tell the truth, if I know what it is. Now we shied naturally at increased taxation and voted against it. Kansas City and St. Louis carried it and adopted it, with the result that in Jackson County, Kansas City pays 95 per cent of the road taxes which are building a magnificent system of highways in that county. They had not yet realized that this movement means that the cities, the towns and villages, the merchants, the manufacturers, everybody shall contribute to the building and maintenance of the roads of the country. Now let us utilize that situation, make the most of it, and when these propositions are submitted to you, let us meet them half way. Now, to clear up some mystification that is thrown around these questions in this convention, the future historian will enjoy himself when he comes to write the history of this great movement, at the rapid progress it has made and the peculiar psychological growth of the road subject. I began just where some of the speakers at this convention left off a year ago, in believing that the national government ought to take a hand in this great movement on condition that the States and the counties contributed their share. My God! haven't they contributed their share? Whose money is this about which we are talking? Where does it come from? It is a false idea, a false conception. The national treasury is not distinct and separate from the State treasury except in the ingenious manner in which the taxes are collected; that is all, and you are contributing every time you turn around, to build up the national treasury, doing it unconsciously. But some of them seem to have the idea, that old miserable, worn out idea, that there is some kind of antagonism between the national government and the State government, and some of them will say "Let's do this, let's insist that the government do it provided the State will do so and so," and we will send—they used to call them ambassadors—from the States, the Senators, the ambassadors from the States, to work upon the general government and plead with it for a part of our own money. Now, that is an altogether false conception of the powers of government, of the duties of government. My theory now is, and if it is not yours, it will be, because I have traveled exactly over the same road that some of you are still traveling—I listened to a tremendously

distinguished and highly accomplished and educated—a real statesman—the other day, and I said “Why, he is fine,” and still he is growing rapidly, he is now in the kindergarten class, he will graduate by and by and be an out and out national road man; there isn’t a shadow of doubt; it is like a Texas steer, if you once get him in the chute and prod him, he will go right on. Just one other idea; I have been sitting on this rostrum here and this thought occurred to me; there’s the greatest highway in all the world, I don’t except any, right there. Why not turn it over to the State of Michigan? Why not let Michigan take care of that great highway and control it? Can you, for the life of you, draw a distinction between that highway and any other great national highway in this country? The Supreme Court of the United States has said recently that there is no distinction under the commerce clause of the constitution, no distinction between transportation by water and by land. Congress has found no difficulty, no constitutional difficulty, in contributing more than \$600,000,000 to the water highways of this country, to the rivers and harbors, more than half of which has been wasted; but when you ask them to contribute something to the building of national roads, they at once meet you with the proposition that we are in favor of doing that provided you will contribute an equal amount. We will let you have some of your money if you will raise an equal amount with what you have already paid. You did not resort to that in the passage of the rivers and harbors bill; neither did you when you voted away more than 200,000,000 acres from the public land States of this country to the railroads. I ask you and I am going to continue to ask you, where do the railroads of this country stand on this great question? Are you with us or are you against us? If you are behind the Shackleford idea, then I know where you are. I know where you have been on the rivers and harbors legislation of this country, but if they can, this question will be put just where the rivers and harbors legislation has been for the last fifty years—in the pork barrel. They have kept it there and I know why, and I know that that is the scheme in Congress now. Why, when we passed a resolution through the last Congress in Washington in favor of appropriating national revenues to the building of a system of national highways, it was moved to amend it by turning it over to such roads as Congress might decide in favor of. What did that mean? It meant, we will take this money, we will vote in favor of this appropriation provided it is distributed among the congressional districts. Now they take offense, some of them, at the statement that they are pork barrel statesmen. Let me show you—and I quote their own figures. Suppose Congress should decide to appropriate \$3,000,000 to the building of a national highway across the State of Missouri, about 300 miles. At \$10,000 a mile, it would cost \$3,000,000. If, instead of doing that, they would turn it over to the State legislature to be parceled out among the counties, it would give \$30,000 to each county, with that they



could build just three miles of road in each county. Under the other plan, they would build one great highway, at least, clear across the State. Suppose they built eight roads? Then the government would have built 2400 miles in the State; at \$10,000 a mile it would come to \$24,000,000. That amount, divided up again among the counties would give \$240,000 to each county, or 24 miles of road in each county. Twenty miles is an average across each county. The nation, under that principle would build 160 miles of national roads, while under the Shackleford idea, if the money was distributed and all of it put into roads instead of into the pockets of a lot of road officials for political purposes they would build 24 miles of road instead of 160. Now that is it exactly, brother. I am a conservative of the conservatives, yet they talk about me being a radical, every once in a while. Mr. Shackleford says that in five years he proposes to build a million miles of road with the national revenues. What does that mean? At \$10,000 a mile, that means an appropriation of \$10,000,000,000 in five years, \$2,000,000,000 annually. That means, if it means anything, absolute national bankruptcy. Why, there is not a government on earth that could stand such a scheme as that. Now that is enough to say about that; I dismiss him and dismiss his idea and consign him, together with the Congressmen who stand by him—and I know most of them—to that oblivion which he has so richly merited. Now I will talk just a minute about another Senator's scheme, and they say he is a financial wonder, a financial genius, Senator Bourne. These played out politicians, when they lose out at Washington, they go to work and get on a committee. They made him chairman of a joint committee and he has got up a scheme for national aid, federal aid, and I want to tell you in a nutshell just what it is. He says that if any State—and he has prepared a table showing us how much we may expect under that, I don't know what Michigan would receive under that, I expect about \$25,000,000, but before she can get a dollar of it, he proposes that the government shall issue bonds to the extent of \$3,000,000,000. Do you know how much that is? I don't. I haven't the faintest conception and neither had he—\$3,000,000,000—and sell them. Lord! I wonder where he would find a market for them—3 per cent bonds, and then let the States issue 4 per cent bonds and pledge those bonds as collateral to remain in hock for fifty years. Now, my farmer friends, you see where that lands you.

A DELEGATE: I'm not in favor of that scheme.

JUDGE LOWE: Of course you're not, and no other level headed farmer under the shining sun is in favor of it and never will be. Just work out that scheme. We put up, in the State of Michigan, about \$25,000,000 4 per cent bonds and he says—and the magazines of the country have commented on it favorably and have said "Why, at the expiration of the fifty years, they cancel the bonds,

the government does, cancels the State bonds and hands them back." True, and they think that is an act of great magnanimity. Great God! why not, when the State had paid the bonds twice? Count it up, 4 per cent on \$25,000,000 for fifty years is \$1,000,000 a year, isn't it? \$25,000,000; \$1,000,000 a year; in fifty years you have paid off your \$25,000,000 and paid it to the government, because you have paid the interest on its bonds in the meantime, and the bonds ought to be canceled, oughtn't they? But what else does it do? It ties you up for fifty years, perhaps exhausts your bond voting power and you cannot anticipate. This scheme won't work unless you take it for fifty years. Now, if that is national aid, may the good Lord deliver us from any national aid, and let me just say a word on national aid; that is the most wretchedly misleading proposition under the shining sun—national aid, federal aid. I used it for a while but have cut it out of the literature of the Old Trails Association absolutely; we never use it, because it is absolutely misleading, and we don't ask federal aid. If a road ought not to be built because it is right, because it serves a great national purpose, then the national government has no right to lend its aid to the building of any such road. Old Jackson was right. He was sometimes wrong, but he was pretty near always and Clay was pretty near always right; but Jackson was right on that proposition when he vetoed the Clay bill. He said "Your road is a local measure." Mr. Lincoln, in discussing that question said, "It is true that scarcely any improvement is so local in its character as to be of no general benefit, and that is especially true of a road proposition," but unless a road is of a national character, I maintain, I don't care what powers you may have under the constitution, maybe you have the right under it, to appropriate this money indiscriminately, but I do claim that the correct policy is to appropriate the public funds for public purposes and no other. Now let us stop taking about national aid and let us go to the government and say, "Build a system of national highways and maintain such system." That is the correct doctrine. When you do that, you need not appeal to the States to share in that great effort. You need not go back to the States with your ambassadors and ask them to negotiate with them; you do not even have to ask the right of way. I have made tremendous progress; if I had very much States' rights in me, they shot it out of me in about four years; they gave me a devil of a wallop. I have been reconstructed ever since. I don't shy at any of those questions. The national government has as much right to build a highway across the State of Michigan as to build and improve that highway out there [pointing to the river].

Now I have scattered around over questions enough to make you talk until the next annual convention. My subject for tomorrow was to be "Storm Centers to be Avoided in the Campaign for Better Roads," and I am going to say a whole lot about avoiding these storm centers, and here I have been setting up about a dozen of them



myself. Now Gentlemen, let's get together, and that is the thing we can do and ought to do. There are several questions closely related to the ones I have mentioned that I would like to discuss; if it was not for taking up the whole forenoon, I would do it, but this is enough, let's keep this; if we are going to build any roads in this country, let's stand for a system of national highways built, supervised and maintained by the government; a system of State highways built, maintained and supervised by the State and by the counties and the townships. Then we will have a system of roads that will be worth while. Then we will have roads that go somewhere, not like your roads around Detroit, you've got some splendid roads, but we didn't get three miles outside of the city limits of Detroit before we plunged off into the mud, and I wonder what became of that gentleman who said that earth roads, natural roads, were the best? I wish he was here today; I want to go out with him; I want him to see some of these roads right here near Detroit; that may be so down in North Carolina, where the tar heels all live. I don't know, I never saw them, I expect it is so because he is a fine fellow and he said it was so, but I would like to see one of them; you'd have to show a fellow from Missouri. Now, if we get behind a uniform plan and stay by it, those fellows at Washington keep their ears to the ground all the time, they are watching the situation and are ready to act and going to act, going to do something, preferably so they can go back home to their district and say, "Just look what I brought you." Now, I thank you gentlemen and will give way to somebody else.

THE CHAIRMAN: In all of these movements there can be no success attained unless everybody joins in them, and among the people who are now most interested in good roads, naturally interested in the good roads problem, I consider are the men who work and toil upon the farms of the country. They have a representative here, one of their own men who is high up in their order, and I have the great pleasure of introducing to you Mr. N. P. Hull, of Diamondale, Michigan, who will speak upon the subject, "The Farmer and the Road."

## THE FARMER AND THE ROAD

By N. P. HULL

This morning I am a good deal like a certain fellow down in the State of Ohio—you people will appreciate this—I guess you have all heard of the excellence of the clay roads of Ohio in a very wet time. This fellow was going down those roads, one of the worst ones, afoot. He had on rubber boots up to his hips. He got in a very bad place and stopped to look the ground over. He felt

one foot sinking; he changed his weight over onto the other and tried to pull this out, and the foot on which he placed his weight went down as far as the other came up. He worked that way for a long time there and a gentleman who lived alongside the road saw him there and went out and said, "What's the matter? Are you stuck?" And the fellow says, "Yes, and it is the worst sort of a stuck, too, for I haven't anything to unload." I am somewhat in the condition of that man this morning, that is, I haven't very much to unload. The officers of the A. A. A. wrote me about a week or ten days ago and asked me to talk here this morning and say something from the farmer's standpoint, but they did not say anything about what the topic was to be and I did not know the subject I was to talk upon until I got here this morning, so I have not had a very large opportunity to load up so as to have anything to unload upon you this morning. Now I am not going to try and contribute so many new thoughts to this matter. What I say, and I'm not going to talk a great while, will be more along the line of a rehearsal, but I feel justified in that because no great movement has ever come to its full conception without rehearsal and re-rehearsal. We must talk these things over and talk them over again before we can all come to a conclusion or before we will all see anything like the full field we are to consider, and at rehearsing, I am pretty fair; at original thinking, I am not so good. It has always been rather easy for me to talk, in fact I never got stumped but once; I will have to tell you this little incident—I wish you wouldn't take this foolishness down—to show that even a man who talks a good deal will once in a while get stumped. I visited a friend of mine over in Massachusetts some time ago, and in the evening, knowing I was quite a hand for amusement, he says, "Hull, they are going to have an entertainment over at the Institution tonight; would you like to go?" I said, "What kind is it?" He said, "It's the deaf and dumb asylum." I said, "Yes, I am in for most any sort of an entertainment." So we went over. We got over there and it turned out to be a dance. I stood and watched those dancers and among the young ladies dancing there were two or three very beautiful girls. I watched them for a while and said, "Jim, it's too bad these girls are deaf and dumb; there are some pretty girls among these deaf and dumb people here. Do you know that if that girl right over across there (pointing out one) if she wasn't deaf and dumb I would like to dance with her myself." He says, "That won't make any difference, her being deaf and dumb, she can dance just as well as though she wasn't." I says, "Yes, I can see that, but I can't ask her to dance, because I don't understand this finger language." He says, "I can fix that for you; I can talk the finger language well enough to introduce you, and these girls get to understand the language of motions clearly; so you just go over there and make the right sort of motion and she will know what you mean." I says, "Yes, but I don't know what kind of motion to make."



He says, "You look right in her eyes and make a motion like putting your arm around her waist and she will know what you mean." He took me over and introduced me; I looked her in the eye and made a motion like putting my arm around her waist and then I girated around the floor. She assented and then I thought again how really sad it was that that girl was deaf and dumb, because I could think of a lot of sweet things I'd like to say to her. Just before the music started, a fellow said to her, "Come Grace and have a dish of ice cream with me." She said, "I'd like to, but I promised to dance with this dummy." Now seriously, just a few words in regard to this great road proposition from the farmer's standpoint. While I did not hear Congressman Shackleford the other day, I know the Congressman pretty well, I have talked over this matter of good roads with him, and I noticed he stirred matters up here the other day and that even Judge Lowe, from the same State of Missouri, does not agree with Mr. Shackleford. If these men from Missouri that have to be shown, don't agree, of course it is easy to conceive where others of us may not agree. I don't believe that the farmers need necessarily disagree in the matter of good roads where those good roads ought to be placed and how they ought to be paid for, if the farmer is to get a fair share of the benefit of good roads, and I am just a good enough farmer and I believe sufficiently in the justice of the farmer's cause, to believe that he ought to kick unless he does get a fair share of the distribution of the benefits of good roads. Now, the farmer, the judge says, and it is true, had been the man who has moved very slowly in this matter of good roads. Farmers who study and think along these lines must agree that the farmer has been over-conservative in a good many instances, but you men here who have lived out in a new farm country, on a 40 acre farm and have made a living there, raised a family and provided against your old age, know that it is a proposition and you know that when it comes to a matter of high tax, you are going to stop and think several times before you rush into that and you are apt to be pretty conservative when you have spent your life on a farm of that sort, striving to educate your family and provide against the old age that you know is coming on, and when that conservative farmer read that good roads cost from \$2,000 to \$10,000 a mile, he says, "It will take more than my whole farm to build a road in front of my farm; I think I ought to be a little conservative about the matter;" so don't blame the farmer too much if he has been conservative. He has been and is conservative, and it is a mighty good thing that he is conservative, because he has been the balance wheel, in a way, and has kept the men from some other industries from going faster and further than they ought to go. Now, we are all pretty well agreed today that we ought to have better roads, that we have come to a time when we must have better roads, and we have generally come to agree, I think, that the cost of building and maintaining these roads ought to be equitably

distributed between the locality, the State and the nation. The farmers, I think, the great majority of them, are today ready to come and stand with the automobile manufacturer, the automobile user, and say that we will contribute our fair share toward the building of good roads, if those roads, as I said a few moments ago, are to be equitably distributed; but, my friends, you will not blame us farmers of this country if we set back in the breech and set back pretty hard, if you are going to build with the money that we help to contribute, a national highway that is not coming within a hundred or even a thousand miles of our homes or the roads over which we travel. Now, there are a great many different theories in regard to how these roads are to be built and where they are to be built. I say we have come fairly well together in the matter of agreeing how the funds shall be raised. Now, the question before the man who is honestly interested in better roads in this country is to decide fairly where those roads are to be built. I, as a farmer, and this great national farm organization that I represent, have no objections to boulevards being built across this country. We have no objection to great national highways or old trails or memorial highways or anything of the kind. We have no objection to State highways that shall join the larger cities of the State; in fact, we know there are farmers who live along those highways, and in fact we know that the greatest traffic is upon those highways and we are ready to agree that those highways shall be improved and we are ready to help raise the money to improve those highways, but we believe that at least a fair share of that money ought to be spent to improve the roads from the doors of the farmers who live scattered over this State and other States to the market center of that farmer. Now I don't want to speak to you here from a selfish standpoint this morning. I believe I am justified in saying the things that I have said, that is, the farmer's contention, from the fact that money cannot be spent for better roads, that will improve the condition for a great majority of the people or that the greater majority of the people ought to be interested in any one road than that road that leads from the farmer's door into the market or from one farmer's door to another farmer's door, or to the church door, the school door, or the door of the grange hall and other institutions that enable that farmer to get out and mingle with his fellows. I want to say to you road men as to every other good thinking citizen of this country today, there is no question before the American people that means more to them, that means more to the perpetuity of this great nation of ours than the improvement of the condition of the American farmer, to make the life of the American farmer pleasant and the home of the American farmer more attractive to the great majority of our citizens in this country. There is one question that is bound to come close to us all, and that is the great question of the food supply of our people. A little over thirty years ago, approximately, out of every three



people in the United States, two of those people were upon farms producing the food to feed the three. After thirty years, approximately, out of every three people in the United States, one of them is upon the farm producing the food to feed the three, and the trend of the past decade and the trend today is all away from the farm into the cities. My friends, I just stop and ask you, if something is not done to stop the trend of that movement from the farms into the city, what is going to happen to this nation of ours? What is going to happen to the people of the city? We want a certain number of our people to go from the farms to the cities, because we want cities and we know that we would not have cities that would be worth while for a great many years if we did not send the new blood and the stamina and the gumption and the ginger from the farm home into the city. We need a certain number of those boys to go into the cities, but I want to say to you that the time is here when, for the best interests of this great country of ours, we must keep a part of the brains that is growing up in the country back there in the country, and nothing is of more interest to the dwellers of the city than that we shall be able to keep some of the brains that are growing on the farm out there in the farm home. Just let me give you another illustration along this line. One of the supervisors in one of the best agricultural counties in the State of Michigan, last spring when he passed his assessment took a census to determine the ages of the men doing the farm labor in that township, and what do you suppose was the average age of the men in that agricultural township in an agricultural county in the State of Michigan? The average age of all the men doing the farm work in that township was 55 years. Now let me stop and ask you, if we go on with that and increase the average age of the men who are on the farm, how do you expect to be fed in the cities at all? We must change that. I have always lived upon a farm, I have always been interested in a farm and, like our friend from Missouri, I haven't any money invested in any other industry than that of farming and agriculture. Perhaps I see the farm end of it, but if I see the farm end of it too clearly, I want the man who sees the other end of it more clearly to tell me how the people of this country are to be fed and how this nation is to go on in its national greatness as it has been going on for the last hundred years or more, unless we are able to keep more of these men upon the farm, and I want to say to you, from a study of farm life, that I don't believe there is any one thing more essential for the betterment of the institution of agriculture, I don't believe there is any one thing that will help to make life upon the farm more attractive, I don't believe there is any one thing that will help to hold the men upon the farm and the boys upon the farm, more than to have a good passable highway from that farm home to the city where the young man can get out and see his girl, not six months in the year but twelve months in the

year. Not only where the farmer can get his products to the market when they are cheapest, but where he can get his products to the market for twelve months in the year, not only for the benefit of that farmer, but for the benefit of every other citizen of this great country of ours. So I want to say to you that in this consideration of better roads and where to build those better roads, build your national highways, build your State highways but, my friends, don't forget the man at the other end of the bad road; don't forget that it is not only that man that is interested, but every other citizen of this country that is interested in making that man, in bringing that man closer to his market and closer to his fellows and making life upon the farm more attractive, because it is not only for the interests of the farmer, but it is for the interest of the automobile builder, the automobile driver and every mother's son, every man in this country who is interested in the building up and perpetuity of our great American institutions. Thank you.

THE CHAIRMAN: I have been very much interested in Mr. Hull's statement, and I think possibly if he understands our system in New York, he will appreciate what we have been trying to work out there under our scheme of 12,000 miles of highways in New York State; we are trying to re-arrange our county systems so there will not be any section of New York State outside of the Adirondacks and Catskills that will be further away than five miles from any State or county highway, and then, with the money that we appropriate directly from the State treasury to the towns, we seek to make the towns build the proper connecting links in these five mile breaks so that every man in our State will have a road for twelve months in the year whereby he can, by going a very short distance over our town roads, get wherever he wants to go. We ought to have our national highways that stretch across the country, our State highways that tie up with the national system; our county highways that tie up with the State system, and then we must have our town highways that tie up with both our county and State systems. We are trying and I think will work out a pretty good scheme toward that solution. In our State we have, I think, a unique system. Our local boards of supervisors elect a county superintendent of highways and that county superintendent of highways, elected by the boards of supervisors of each county, has to do, in a way, with our State and county highway construction, because no State road, built in a county, can be or will be accepted by my department unless the county engineer approves of it, and no county highway can be accepted unless the county superintendent and board of supervisors approve of it. I am asked to call upon Colonel Suggs of Oklahoma, which is a great big State and wants national roads and probably needs them.



## ADDRESS BY COLONEL SIDNEY SUGGS

*State Highway Commissioner of Oklahoma*

I have waited long and patiently. I have heard so many discussions on the subject of good roads and better roads that I have really forgotten what I intended to say myself on that subject. I don't have to explain to you people that I am a farmer, my very looks show that.

We were out last night, a number of us, to a show. I was very sorry that we couldn't pull off that show as it was intended by Mr. Warren. We had a good Light at the start, but we lost that Light; he went out to an executive meeting. He discussed some things last night in which I coincided with him. Down in Oklahoma things are different to what they are up here in Michigan, to some extent. We have some good roads down there and we have some very bad roads. We have some old roads—you'd be surprised when I tell you that I have traveled over roads in that State that were built eighty or ninety years ago, laid out, that are good roads today, splendid roads, that will hold a steam engine, not only an automobile or a traction engine, but a steam engine; but there's not enough of them. I don't know, my talk is sort of automatic, self propelling, and I have been crowded so many times that I arranged my speech sort of like a freight train is made up. Whenever the fellow jerks my coat, I just put on the caboose and the story is ended. About the beginning of the good roads business, I find now that I am sort of in the condition I was eighteen years ago at Guthrie. We had a good roads meeting at Guthrie, Oklahoma, and of course I was there; it was the first meeting that was ever held in that State, and do you know that we went and stayed all day and late in the evening? We had our resolutions committee out and we had all of our arrangements made to build the road and we actually went down in our pockets individually and made up money to send two men to California to see how to build these oil sand roads. We heard a good deal about that road they built out there by putting oil on the sand and fixing it up, and we didn't have a right-of-way to build a road on. We sent those men out there. Then, when we got statehood, which was the thing we were all praying for, and this Convention, while it is so much better than any other I ever attended, still reminds me of a trip I had to make to Washington to see Mr. Hitchcock on some very important matters for our country, the Indian country, and there were three of us who went, one from the Chickasaw nation, one from McAllester and one from Ardmore. I was the representative from Ardmore, and whenever Mr. Hitchcock was down there, I armed him around, showed him our magnificent pavements and sidewalks and so on, and thought when I got to Washington, of course he'd be mighty glad to see me, and I don't know, he was glad to see us when we walked

in, treated us just as nice as he could; we went in and he said "Gentlemen, I am very glad indeed to have you come this morning. How can I serve you?" I was all swelling up you know, it was a little out of the ordinary for gentlemen from the Indian Territory to see the secretary of the interior. I told him what our needs were, and then I had a sideline for Ardmore, some little special needs for Ardmore. The other gentleman told him what the general wants were, but he had a little special line for Chickasaw; the other gentleman told him about what we needed in the Indian Territory, but he had a sideline for McAllester. All of us felt like we had done our duty, but do you know what that man did to us? He said, "Gentlemen, I am very glad to have you here, but I would advise you to retire and resume your labors and when you have agreed on what you want come in and I'll hear you. Good morning." I went out and looked at the other fellow and I said, "Did you do that?" He says, "No, you done it." Well, we didn't know how to speak to each other for a few minutes, we were each accusing the other fellow of doing that. He said, "Good morning." We went out and got together and I do hope that this Convention will get together on some proposition that we can carry to Congress. Let us unite on some one proposition and let them know that we are interested in that one thing. Let us agree upon it. I tell you, if you will pass resolutions here like I believe will be adopted by this Convention, I am going to volunteer to see that your action is endorsed in Oklahoma; and I believe I can have it endorsed in Arkansas, as I have to be there on the 14th of this month at the meeting of the State Good Roads Association, and I would like to assist those men from Arkansas in seeing that resolutions that you agree upon here and pass, is passed in Arkansas.

A DELEGATE: I will take it to Indiana.

COLONEL SUGGS: All right, well, who is next? Let every man go home with the determination to see that those resolutions are adopted in his state and we will make it so warm for those fellows that they will hear us.

A DELEGATE: We will adopt them tomorrow.

COLONEL SUGGS: Good. On this road business, I am liable to talk to you largely about Oklahoma, and I don't want to appear like the fellow did that was making a speech in the city and the old man couldn't go to hear it, but had a negro that could repeat any speech he ever heard and he sent him to hear the speech and repeat it to him. The negro went to the meeting and came back and he said, "Jim, what did that man say?" Jim said, "Boss, he made a powerful speech." "Well, what was it about?" "Well, sir, the most of it was about a recommending of hisself." Now,



I don't want to be here recommending myself. But, when our constitutional convention met in Oklahoma, there was two or three of us there—I wasn't alone, and we decided that we ought to take time by the forelock and have a department of highways created during the sitting of the constitutional convention, and after working there for weeks with that convention, we finally got the good roads committee appointed, a committee on good roads, to frame some road law. We got before them and it was a very short article, just brief, but it said this: "the legislature is hereby directed to create a department of highways." Now, we worked on that word "directed." We wanted to get something there that they could not slip over. We didn't say, "they may;" but we said, "they are hereby directed;" and so it was written in the constitution in that manner. The first legislature failed to notice it. The second legislature failed and for sixty days we worked with the third legislature and we got that law vitalized by one vote and had to ask a man to change his vote in order to get that, before it was announced. Then the fourth legislature came on. The third legislature vitalized it and I was appointed the State commissioner of highways. I was about the proudest fellow you ever saw, and I just knew that the fourth legislature was going to do all that I asked. I made a report showing where we had spent \$4,000,000 in the State, showing what county it had been spent in, showing the levees, showing all those things, but I couldn't tell where it went; there was no record kept of the amount of bridges they had built or the lengths of them, the amount of culverts, etc., but the \$4,000,000 had been spent. I showed it there to them, and I just felt that when the legislature met I could just walk in there and say, "Now boys, we have squandered about \$10,000,000 on roads and bridges and there is no county that can give me any definite idea as to any definite amount they have spent or the length of the bridges or even the contract price; now then, I would like for you to pass this law"—I had the law already prepared myself; I never dreamed of any opposition. Why, you know how a fellow will get that way, have it all fixed up in his own mind and think everybody agrees with him. I never made a bigger mistake in my life. When I went to that legislature, do you know what they said? They just spent sixty days and abolished the department of highways and Sydney Suggs every morning for sixty mornings. Why I was told that one morning—I wasn't there—that the Chaplain said "Oh, Lord, give us this day our daily bill to abolish Sydney Suggs and the department of highways." Abolishing the office, abolished the department; they said, "We've got no use for you." That did away with 3300 township trustees. I was trying to make the county the unit. Let the county build the roads and make the county the unit, and the way it was down there, every township was a unit and those three commissioners bought the culverts and bought the toy tools, the wrinkled tin and toy tools and bridges up to 12 feet, and 3300 of them buying those things, I never

thought about all those fellows having friends in the picnic eager to get some of this money. The trouble is here, it is here for you and they are keeping a lobby right down here, the wrinkled tin, the brokers bridge, and why I call it a brokers bridge is because it is a bridge that is made to sell, it is not made to carry a load. That's the way those bridges were—and the toy tools. Send them out there, and there were 3300 purchasers and they were buying them with the people's money. Why, in my own township, they spent \$53,000 there building roads. I live in the same township the governor does. I said they spent it in building roads—I got that wrong. A man always gets wrong though when he says they spent that much money there—but we never could see where it went. There was one of our commissioners that built a road leading north and he had five bridges in a mile and a half. There was a little creek that ran down between two hollows and he followed that down, when, if he went over 150 feet, he could have got through and put his road on a firm foundation. Now, Ladies and Gentlemen, there is something to this road business that has not been discussed here; there is more to it, it seems to me. I have some idea about the results of the road business. There's a lot of evils in this country that we have got to stop, and I believe that in order to stop them effectually, we have got to reduce the cause. How are we going to do it? You can send up here to Mr. Page and for 5 cents he will send you the amount of freight you can haul over a mile of road, over a bad road, over a good road and a bad road, the difference in the hauling of a load of freight over a good road and a bad road. He has got that figured down, got the time figured down, the saving of the horses figured down, got the saving of the harness figured down and the saving of the wagon; that's all in figures, and you can have it for the asking. But, my friends, I contend that there isn't paper nor pencils enough in this United States to figure out the saving of our boys and girls that are coming to the city on account of the bad conditions in the country. The cities have been robbing the country of the best brains for a number of years—fifty years, possibly. I tell you it is deplorable. I have been to one or two of your cities in the east and I have heard the gentlemen there talk about it. I am not using my own experience, but just what I see and what they tell me. The young man that makes \$15 a month on the farm saves up \$100 or \$150 and concludes that he has made about enough to go to the city. They tell him, "There you can get \$15 a week, four times as much as you can get in the country." I tell you that's a dazzling offer to a young man and he studies it out, figures it up and decides he can do better in the city and he goes, he leaves the farm; he leaves the things that he is acquainted with and knows how to manage; he goes to the city; it even happens in as small a place as Oklahoma City, which has only about 62,000 people. I have seen them come there, boys from home, I knew their parents; they didn't realize when they got there that there were hundreds



of parasites and leeches that just live on his sort. The only way they can get any money is catching the greenhorn from the country and they pick him till he is clean. In three months time that boy has resorted to things that he is ashamed to tell his mother. It don't only apply to the boys, but it applies to our girls. One in twenty will succeed. It is like the old '49ers; some of you gentlemen remember about that, hearing about it and a number of you remember about the Klondike. Those that went to the Klondike and those that went to hunt gold in California; those that succeeded, their names were written at the top of the page, but who ever recorded the thousands that fell by the wayside? And that's the way we are going. It is an abnormal state of affairs, and how are we going to remedy it? How are we going to remove the cause? What method have we got? Take a young man to the city and he learns the art of working in machinery as they are doing right here in this city, and I want to say to you that as long as he is able and as long as his sight is good and his nerves are steady so that he can turn that journal to the thousandth part of an inch that is required in that institution to make that machine perfect, he can work there, but after he has worn out a dozen machines that cost that company \$1000 a piece probably and seen them dumped over into the scrap pile, he knows that when he gets in that condition that his eyes are dim and his hands a little nervous so that he cannot do that work, he will be dumped over with just as little ceremony as that machine was dumped over. I want to say to you that we have got to build those roads, we have got to build them in some manner; the way to do it is what we are here to discuss, the best method; the result is what we want. My contention is a good deal like that of Judge Lowe, that the quickest way, the best way and the only way that we are going to get the results that we so much desire is to let the government build its roads and then maintain them as government roads. Then I believe the States will have pride enough to build lateral roads into these government roads and in my State I will guarantee that the counties will have pride enough to build laterals into those government roads, and in my State I will guarantee that the county will have pride enough to build laterals into the State roads. And then I will go on down to the grass roots and I will see that the townships build laterals into the county roads. I will go to every schoolhouse and go all over that county, and I know the nature of those people, but I tell you, when we get to talking about good roads down there, there's some member of the legislature will get up and want to amend the bill. I told one of them—the man is in Congress now—I says, "You are afraid to fight that bill in the open, you are ashamed to do it and you know that your constituents will turn you down, but you amend it, put on enough amendments to kill it, and here you are talking about building a lateral road into your town without having a trunk line. They don't build laterals first, they build trunk lines first;" and I think this subject is of so

much moment that I wish I could elevate my voice sufficiently to be heard in the halls of Congress. The government has got to set the example and then the States will follow, but unless there is enough earnestness displayed here to let those men know that we are in earnest about it, I am afraid they will pass it up, I am afraid they won't hear us; but I wish they could hear us and know. You think about what the government can do. In that western country they have given thousands and thousands of acres to railroads to open up that country; the railroad company has made money out of it. Why shouldn't they help to build the mains that feed those arteries in the very same kind of a way, in the same manner? Look at what they have given to the rivers and harbors. Why, they are even appropriating money for air ships. That is all right, but let's get the roads first. I want to see the time come, and I tell you it is approaching in our country—we've got the railroads down there a number of them, and are building more, and the world is our market. We have got land there—I attended the Kansas City Land Show a year or two ago, where they were selling lands in Utah, Colorado, Oregon and California at \$500 an acre, and I want to say to you that we have got thousands upon thousands of acres in Oklahoma that is just as valuable as any of those lands, we've got innumerable streams, living canals that, with their own power, will irrigate those lands, but we must have roads to get the products of those lands to the market, and I made this proposition to towns down there, I made it to my own town, I said "If you will build these roads in here and sell this land in small quantities to the man that wants to till the soil—and I say it ought to be made possible for every man who actually tills the soil, for him to have an opportunity to buy that soil and own that soil that he is tilling, I don't mean to give it to him, I mean he ought to own it, to become a home-loving patriotic citizen as he would be if he owned it, even though it was only 20 acres, if it was his land—you can't get much patriotism out of boarding houses, a man won't fight for a boarding house but men will fight for their homes—I, at my age, and I am not so very old, can take 5 acres of ground, 10 miles from town, and if we had a road out there so that a gasoline wagon could come out every morning and take every bunch of shallots and lettuce and tomatoes and okra and asparagus and eggs and butter that is raised there on that 5 acres to the market, I will make an independent living. That's the last country we are going to open up, and I told those people down there that we must get together and keep our young people at home. They can't go into new countries and get lands as some of us have got them down there. There are no more new countries to be opened up. Let us make it possible for them to stay here, make it possible for them to get their homes here. We cannot do it if we go on as we are. You know that the greatest intelligence of this country, you will find it by going right here in your own city, you will find that the best brains are invading farm



machinery, making farm machinery to cultivate the land, and they are making machinery to harvest the crops, and what does that mean if we don't build these roads? If we don't get together and build these roads, in fifty years some of our country will be a country of landlords and tenants. We have got to build the roads in order to avoid that. One man will control 10,000 acres, and what will the others be around there? They will be hirelings and they will be tenants, won't they? Is not that the history of other countries? And to think about our State, where we raised enough last year in our gardens, on our vines and trees, to pay the taxes of the State, that rotted on the vines because we couldn't get it to the market. It's a serious proposition and I hope that before this convention adjourns—I don't care, I've come a long way, if I had to stay a week longer in order to get results, I'd stay. Twelve years before Statehood, I built my own school house, I sawed the lumber with my own mill, I hauled it out of the woods with my own ox team and in many instances, I drove the oxen myself—I'm not telling you that to make you think I've done anything great, I had to do it, and I built my own house and built my own benches and hired the teacher to teach my five children, and I built 20 extra seats that I rented to him for \$1 a month, I gave him \$10 a month and those seats and his board and lodging, and he rented the others. I then went, when I saw what was going on in that country, I went to Little Rock, I started on a tour, I went over there and told these men I thought I'd put it in a commercial way, I was the president of our Commercial Trust, and went in a commercial way and told them what we had. I told them that I hailed from the biggest inland cotton market on earth, and it was at that time, as high as 50,000 bales of cotton was hauled into that town of Ardmore annually and sold off of the wagons by the men that raised it. They said "What else have you got?" I said, "We have got the finest wheat on the globe growing in the valley of the Wachitaw and the Indian Territory." They asked, "What else have you got?" I said, "We have got the finest cattle country under the sun; we take the premium at St. Joe, Chicago and Kansas City for the best short horned cattle." "What else have you got?" I said "We have got 100,000 bright eyed boys and girls who are sons and daughters of pioneers, and 10,000 of those are growing over age every year and our jails are filling up with those boys and it is for them that I have come to plead." Now the government is sending boatloads of teachers to the Philippine Islands to teach those people and the very best people of America here need some help, and at Little Rock they passed a resolution and notified their Congressman to help us out. I went to Memphis and met five different organizations with the same result. I went to St. Louis and Kansas City on that same mission and men stood around and said, "I wonder where Suggs is getting his graft?" I said, "I got it last spring, I got it all off, and I got all the money, all the interest and

*congratulated* interest when I was called upon to address 300 bright-eyed boys and girls in the City of Ardmore where they marched in and took their seats in a \$100,000 school building. There wasn't a man in Oklahoma happier than I was. I told these boys and girls that when they got through with their education, they didn't have to leave Oklahoma for a better State, for in Oklahoma the grass grows greener, the sun shines brighter and the birds sing sweeter than anywhere else, and we have got the best boys and the sweetest girls on earth, and when you get tired of this country, come to Oklahoma and help me out in building good roads.

October 2, 2 p.m.

HON. J. N. CARLINER, Chairman

THE CHAIRMAN: Gentlemen, the discussion that is going to take place this afternoon is one that is very interesting, particularly to commissioners in charge of State roads. It is a particularly interesting subject to me, because, under the New York State law, they provided last winter that the State commissioner of highways could make reasonable rules and regulations covering the traffic on State and county highways. We have not made any regulations in New York State yet, because the problems were such that we thought we ought not to be too hasty in taking them up, and I am particularly anxious, myself, to hear what you gentlemen have got to say in regard to the use of State and county highways as affected by heavy truck traffic, and Colonel Sohler, of Massachusetts, who has taken great interest in the subject, will first speak to us on that proposition.

### ADDRESS BY COL. WM. D. SOHIER

*Chairman Massachusetts Highway Commission*

I am sorry there are not more of the highway commissioners here, because I have been having very voluminous correspondence with the commissioners of various States in the Union, who wanted to know what regulation they ought to have for their roads, and we have had much more correspondence in Massachusetts from the towns that have said, "What are we going to do for our roads which cost us \$2,000 or \$3,000 a mile to build, gravel roads, when one man in town buys a truck and runs over that road in wet weather and ruins a road we have been ten years building?" One little town in Massachusetts had five wooden culverts broken in one day by one lumber truck that carried 10 tons, and it cost \$3 on the tax rate to put them back, and a week later that same truck went over a covered bridge and broke that down and it was closed so that everybody had to make a detour for nine months. One



of these six ton trucks, weighing 13 tons probably with a load, went through and broke the bridge between Ayer and Shirley and sent everybody else around for the next year and a half until the county and towns got together and built a new bridge, and they wanted to know what they could do. In the city of Boston, Mr. Sullivan, the road commissioner, saw them getting ready to move some very heavy object, I have forgotten what; he knew the bridge was insufficient, so he told them they must not go over that draw bridge and told the draw tenders not to let them, and they waited until one rainy night and got part of the way over, broke down and got stuck and then he tried to sue them for damages and found there was no law under which he could collect; consequently, about a year and a half ago, I began to study a little on road regulations, because I believe that, contrary to what I saw in the papers in Boston, which said that we must build the road to carry the traffic as the railroads did, I wonder what they would think of a railroad that had bridges that would carry 56-ton locomotives and bought a lot of 100-ton locomotives and broke all the bridges down before they got bridges strong enough to carry them. You have got your roads, and if you do not regulate the traffic, you won't have your roads and won't have the traffic either, because they cannot go over it; and I found that England and France, Belgium and Germany had adopted regulations for various kinds of traffic. They had a regulation—the English and French regulations were very nearly alike but the English was a little more liberal than the French. If I remember rightly, they had a regulation by which nobody could move anything over a road that had more than 800 pounds per inch width resting on the road surface, and we adopted that in Massachusetts and it doesn't make any difference—excuse me a second, we adopted that in Massachusetts for roads that were not pavements, it does not apply on the city pavements; I think it ought to and soon will, it makes no difference whether you use a wheel or board, without a permit you cannot move anything over the road that has got more than 800 pounds per inch width, which is very nearly the steam roller specification; it is just about where the English traction engine goes. We have got into our law a provision that no motor truck weighing more than 4 tons with the load could go more than 14 miles an hour, and no motor vehicle weighing more than 6 tons, including the load, could go more than 6 miles an hour on iron tires and 12 miles an hour on rubber tires, and we have recently notified several of the sightseeing omnibuses that if they exceeded that speed limit on some of our narrow roads, we would take the licence of the man away and take the registration of the car away and he could not run on that road. We have got in our law a provision that nobody could pull anything over the road with any flange or rib that substantially injures the surface of the road to any considerable depth. We said that nobody could move more than 14 tons over the road without a permit. Nobody

can move more than 12 tons over the country roads without a permit. Nobody can collect by law now in going over bridges if they are posted, in Massachusetts, if they move over 6 tons. The authorities are authorized to grant permits and to specify in those permits the particular routes to be taken or any other precaution they desire to take; that the authority in charge of the road, whoever it happens to be, with us, the highway commissioner on one road, the county commissioner on another, some street department or road commissioner in villages—

A DELEGATE: The 14 tons would be on one truck?

COL. SOHIER: On one load.

A DELEGATE: Could they draw a trailer?

COL. SOHIER: Yes, sir. We put another thing in that law, that anybody that violates the provisions of this law, driver, owner, or operator, who violates the terms of the permit, shall pay all the damages and the damages shall be collected and paid into the fund of the person that has to repair that road. We had a fine, of course, but that depends on the police force and the police force will not necessarily prosecute; I don't think we shall, but it gives us a chance to do it. Any local authority is authorized to limit the speed of those vehicles weighing over 4 tons with the load, to 6 miles an hour, over any bridge, provided he posts a notice conspicuously at each end of the bridge. I have often wondered—I would like to hear some one talk about it. I have always wanted time to sit down and figure what the man got out of the road and who ought to pay for it. It is pretty evident to me, or seems to be, that no one individual in the community, merely because he can make a living or even employ a workman profitably, should be allowed to tax the community more than he gets in profit—we'll put it that way if you like. He should not cost the community more than he gets in profit, because if we have to pay more in taxes to maintain a road in order to allow somebody to do a lumber business with a truck over it then he can make in a year, it is easier for the community to put him in the poor house and support him there, because it is cheaper. When the automobiles were turned over on one of our very good gravel roads between Albany and Pittsfield, main through line, it meant 700 cars a day going very fast over this little gravel road, that this little town had borrowed money and built in ten years, with our assistance and in three years it didn't look like a road. It was holes and ruts and mud holes. It was a very good gravel road before that, as good as you can build, but it would not stand 700 motor vehicles going over that road, and those people ploughed it up; they said "If we can't use it, you sha'n't, because our bonds ain't paid yet;" and we told



them to fix it up and we would help them with it next year and we did; we are allowed to put 20 per cent of our vehicle fees, which amount to \$20,000 a year, into improving roads that way and we help them put that road back in good order, and I think they could go over it this year and not do any damage; it is coated with oil and Tarvia. I hesitated at one of my other talks when I saw so many gentlemen from various States where they do not and are not dealing with the problems of heavy traffic as we are in Massachusetts, to discourage them by giving maintenance costs, but it happens to come a little bit in line with what I have been talking about on truck regulations, and so I am going to tell you a little something about England where they keep much better accounts than we do of what the cost, as far as they can tell, of motor bus traffic is. Now an English motor bus is, I should think, just about the equivalent of any one of our  $3\frac{1}{2}$  or 4 ton trucks. It is a double decker; it carries 16 people inside and 27 outside, if I remember rightly. They have five minute service to a great many places from 15 to 25 miles out of London. I don't happen to remember any further out than Hampton Court. They have been recently established, many of them, and as you probably all know, the motor bus traffic in London, if you haven't looked at it two or three abreast and you wonder where the taxi is going through, but when you stop on the end of the main street crossing, you will see ten buses in length and two or three in width awaiting until they get the signal to go across. They were proposing a speed limit at Hyde Park when I was in London, and the traffic captain went before the authorities and said, "We cannot move our traffic if you give us any speed limit; we have got to have the foot passengers and traffic going so they won't interfere with each other, and the traffic cannot get through if they don't go fast, because 10,000 vehicles an hour pass Hyde Park corner and they will back up for 2 miles if we only let them go 2 miles an hour; they go 20 miles an hour when they get to the middle of the street and never let anybody cut in, walking or driving or any other way." In Middlesex County you will find in the *Light, Railway and Tramway Journal* for August 8, the damage done to roads by mechanically propelled vehicles, weight about 6 tons, motor buses—I think the 6 tons would include the vehicle and load—Mr. Wakeham, who is the county engineer, gave the average cost of 16 roads running in and out of London in Middlesex County, main traffic roads, before and after the establishment of the motor bus traffic. His roads had cost him  $12\frac{1}{2}$  cents a square yard a year to maintain as water bound macadam roads— $12\frac{1}{2}$  cents a square yard a year, before the advent of the motor bus. When the motor bus came in, it cost him 25.6 cents per square yard per year to maintain his roads. He gives the whole table there and the variation in cost was between 4.5 and 20 cents before the motor bus, and after the motor bus, between 14 and 42 cents; and one curious thing was that one of his roads, which cost

16 cents before the motor bus, suddenly jumped to 42 cents after the motor bus. His charge in 1911 and 1912 was 1.2 cents per ton, per mile going over that road, and in 1911, 1.8; in other words, it increased because of the motor bus traffic. In his opinion, that is all the traffic showed it to have increased, but the cost of transporting one ton or keeping the road up had increased 0.6 cents or 50 per cent increase for every ton that was hauled over that road, and the increased cost from the motor bus traffic was 4 cents a car mile. Under the special act of Parliament, they taxed them three-quarters of a cent, and the *Light, Railway Journal* was publishing the editorial to show that the motor buses should be charged somewhere near in proportion to the damage they did to the roads, if they were to establish their lines, which again comes back to how much should the community pay, how much more than the 5 cents of that company, if it is going to cost the community 3.25 cents a mile every time that vehicle runs over the road, and I think you will find it costs usually very nearly 1 cent a mile per vehicle to maintain a macadam road. You do it somewhat cheaper with oil. I think that's all I want to say, Mr. Chairman. If any gentlemen will write to us and wants, at any rate a start at a motor vehicle regulation law for motor trucks, etc., and will write to our secretary in Boston, we would be very glad to send them copies of the law that was as good as we knew how to draft at that time. We have got a wide tire law applicable to all vehicles, that was adopted without any opposition whatever from the farmer, but the title of that law was "An act to regulate motor trucks and other things going over the highway," and we did not advertise whether it was a motor truck or an iron tired vehicle drawn by a farm horse, and we got it through without any opposition, and if we are reasonable in enforcing it and gradually jack them up and not make them all do it all at once, I don't think we will have any trouble with the farmers and we will have our wide tire law. There is a penalty of \$100 for each offence.

A DELEGATE: For only using or selling?

COL. SOHIER: A fine of not more than \$100; but for any vehicle that damages or breaks the bridges, if the man is violating the 6-ton law, he has got to pay for the bridge and it cost \$3500 to repair or rather to rebuild a bridge that was broken by one truck between Ayer and Shirley, it took all summer and cost \$3500, but in the Richmond case where I said it was \$3 on the tax rate, the valuation is only \$100,000 in that town. The bridge cost \$1500 to put back; and we have got a great many bridges in my state that are not designed and were never meant to carry anything over 6 tons. We cannot move a steam roller over them and do not do so without strengthening them, but a fellow comes along with a 6-ton truck and a 7-ton load, going 20 miles an hour, and you know what will happen.



A DELEGATE: Is that a local law?

COL. SOHIER: This is a State law, for the State of Massachusetts, applicable everywhere.

A DELEGATE: It could be made a local law?

COL. SOHIER: It is a local law authorizing people to make a 6-mile speed with a vehicle weighing over 4 tons, and we have authority locally to post the bridges down to 3 tons, if the bridge is unsafe, and before this law went through, the man could not recover any damages, but neither could we. Now, if he takes ten tons over one of those bridges and breaks the bridge, he will have to rebuild the bridge instead of you; that is the difference.

THE CHAIRMAN: I am very much interested in that to show how the different traffic laws in this country compare with what they have in other countries. In New York alone the automobile licenses there run to 126,000 in number, of which 35,000 are trucks, while in the whole of France, the entire number of vehicles only amounted to 84,000 and in Germany very little over 60,000. In the State of New York alone we are carrying a great deal heavier traffic in number of vehicles and everything else than they are doing in France and Germany, nearly combined together. I will call upon Mr. Ricker, of New York, our deputy commissioner of highways, because he has given this matter a good deal of study in this State. Under our State law, there is now a provision that no truck company or sight seeing cars or any trucking for profit outside of private business can go into existence without procuring a certificate from the public service commission of New York, putting them in the same category as any other transportation company. There is a large number of applications for permits in our State and we are now considering the terms upon which those permits shall be granted. I have the pleasure of presenting Mr. George A. Ricker, first deputy commissioner of New York.

#### ADDRESS BY GEORGE A. RICKER

*First Deputy Commissioner of New York*

As Commissioner Carlisle has said to you, we have the problem of what to do to protect the property, the roads in New York State, from the unusual, perhaps we might say the cruel and unusual punishment that will be given them by the motor trucks. In the densely populated section of the eastern part of the State, the motor truck is very prevalent. Even where electric railroads are operated, in the roads or beside the roads, the motor trucks are running ap-

parently with profit because they continue to run and multiply in numbers, even in competition with electric railway service. Now, these cars weigh all the way from 5 to 15 tons, and they run at considerable speed. The public service commission is hearing applicants who desire permission from them, as they are now classified as common carriers, to operate over our highways. As a rule these cars—you are familiar with them—run on four wheels; they have hard tires and they run frequently and at considerable speed. I have participated with members of the public service commission at these hearings and have brought out the facts regarding weights, sizes of wheels, loads, speeds for the purpose of selecting data that will enable the commissioner to make rules for the protection of the road. These lines are increasing with such rapidity that it is a very serious problem with us and a very pressing problem. It is not one that we have got to think about for the future; it is with us now, and we are anxiously looking for information from all sources as to the limitations that we shall put upon these cars, as to the loads that they may carry, as to the size of wheels, width of tire and speed. It is no unusual thing to see cars running at a speed of 25 miles an hour with heavy loads, people hanging on the running board, and on one of the hearings, I know an Italian who ran the car and when asked what he did when the seats were all full, he said "We sat them on top." Now, that is a pretty serious problem. In addition to passengers, they carry heavy loads. Of course the difficulty Colonel Sohler has spoken of with regard to bridges is also very serious. Now, we cannot exclude those people from the road; they apparently have the same rights any other citizen has to use the roads, and the people in the localities in which the lines operate want the buses, they are a great convenience. They patronize them liberally, and these buses run all the year around, too, though naturally in the winter time they are not as popular as at other times. A point that has arisen in these hearings is on the amount of money that they shall pay, if any, towards the upkeep or the cost of construction. Where our electric lines run on improved highways, they are required to pay, as all railroads have to with us, for the pavement between their rails and 2 feet outside. Now, the law says that these buses, these bus lines, may be required to reimburse the railways for some portion of that expense which the railroads have already contributed to the pavement. Now, that is a very vexing question. Most of the applicants who wish to run these buses have about enough money to buy a bus and a little left over for a few trips for gasoline; when that is exhausted, then they depend upon their daily receipts. If they are to be saddled with any part of the expense of the pavement, it shuts them out. I am hoping that the public service commission may do something of that sort. I noticed in the car before I came up a paper entitled "What the Automobile has done for Good Roads." I think somebody ought to write a paper on "What the



Automobile is doing to Good Roads," especially the automobile truck. That there is need for more durable types of pavements, of course we all know very well, but how in the world to meet the unreasonable use of the roads that is brought about by these heavy trucks, is the problem that we are studying, and this problem has come up so suddenly that we hardly know where we are at. Any thoughts that any of you gentlemen have growing out of your experience with them, will be very gratefully received.

THE CHAIRMAN: We will be glad to hear from any of you gentlemen in relation to this matter. The matter is now open for discussion.

MR. WASHINGTON: It may interest you and other gentlemen here to know that this question is such an important one, that I find that abroad it has been given attention for more than a century, and I found the other day, in looking over the road history of some European countries, traffic regulations as to the weight of vehicles, the loads they might carry and the width of tires, made in 1809, and as far as I can gather, there were some regulations even previous to that period, so we can see this is a question where, in older countries, they were at the point we are at now and realized the importance more than a century ago of regulating tires and saving the roads from undue wear and unnecessarily heavy loads, greater than they should bear, and in nearly all the prominent countries of Europe, they have drastic and severe traffic regulations limiting the weight, as Colonel Sohler said, per wheel and per inch of tire, and in other words sub-dividing it, in some cases, on the unit basis of width of tire, but limiting the load on a given vehicle. Most of the vehicles in France and Italy are two wheeled vehicles; you hardly ever see a four wheeled vehicle except as a victoria or automobile, all the heavy hauling is done in carts. I have seen a cart of six horses harnessed tandem and I have seen in Paris one with eight horses to it hauling probably ten tons of stone. Sometimes the beds are 12 to 18 feet long, and they pile up casks and building stone on them, and in the ports like Genoa, enormous loads of foreign products of all kinds, and of course very frequently to meet those conditions in the cities they have stone trucks and run those vehicles upon cobble stone blocks 18 or 24 inches in diameter and sometimes 12 inches thick when they are put down, and I have seen cases where they seemed to have been worn down 4 inches and they took them up and turned them. That is possible in European cities where they use their horses tandem, but if you had them harnessed as we harness them, abreast, the horse would be on the smooth or slippery part of the street, not out on the track, and he could not get power enough to pull his load. This is only a trifling contribution, but it may be interesting.

DR. CLUCK (of Pennsylvania): Has it never occurred to any of these gentlemen present that possibly our regulations and licences are not in accord with the road? We in our section have quite a number of motor trucks operating in different vocations. Just the other day I had occasion to pass one, and after inquiring as to the load it carried, I was told it carried 12 tons. We all know that no public highway has been built or is even being built now that will stand such a traffic as that, but as the gentleman has said, large traffic has become a habit, but are these motor trucks, automobiles and all these new fandangoes paying the share of the revenue they should pay for the use of the highway? You take an automobile, and we have heard a great deal about them during this week, the gradation, in my judgment, is not in comparison to the amount of damage to the roads they use. If a light buggy was placed on a macadam road, such as I saw in this city today, it would run for a thousand years and the road would still be there. They told me that road I saw today was put there a year ago, and it is a total ruin. There must have been something to do that, and something more than the ordinary travel these roads were originally built for. That road, I was told, cost the people of this county here about \$17,000 per mile. That is an enormous amount of money to spend on one mile or so of road and have it destroyed in one year. My opinion is this, that license laws as fixed by all the States as far as I have read, graduate by horse power; they say for a certain number of horse power you shall pay \$10, over and above that, \$15 or \$20, and they go on up to a certain standard. This last act I have not read and do not know what it is, but I believe the system is wrong; I think the system ought to be based on the size of the tire, starting with possibly the smallest rubber tire that is used on either steam or gasoline vehicles; it should start with a fixed price, possibly \$10, and graduate for every half inch of tire space instead of horse power, fixing your price so that, while you are not going to drive the business away from you, gentlemen, that's not the idea, but they ought to pay in comparison to what they destroy. No man runs an automobile or truck for fun; no man displaces his horse for fun, he does it for gain, that is every man's object in life, the gain he gets from it, and that is the reason he runs it. The driver of the pleasure automobile drives that automobile because he can afford to drive it, or else he would not drive it. The ordinary business man drives an automobile because he can make more money that way than by going in steam cars or by horse. My idea is this; place a graduated scale of licenses to the inch or half inch or even the quarter inch bearing surface, and then the next remedy I would suggest is this; instead of the funds being paid into the State treasury as they are, they should come back to every county and local municipality where the licence was originally paid from, so that if a bridge breaks down in a township where the



public is already taxed, that comes back, in addition to the fine that the gentleman has well said should be imposed.

MR. SMITH (of New Jersey): Wouldn't it be a better plan instead of taking the measure as the gentleman mentioned, of the width of the tire for the license tax, wouldn't it be better to take the combined weight and speed of the car, because those are the ingredients that do the harm, while the width of the tire does not determine anything. For instance, if you take the size of tire, a Ford car would pay a great deal less than a Cadillac car, which carries a 5-inch tire while the tire of the Ford car is very small and very narrow. I think the three things combined, the size of tire and weight and speed are the three things that should be put together and made a composite from which we should draw the figures, and I think the license should be a federal license and returned to the counties or States in proportion to the number of roads they have in that county; they would be paid right back to the State and the State in turn would pay the money to the counties and that would be an inducement to the counties to have more roads. I believe our association, the A. A. A., are working for a federal licence law.

MR. WRIGHT (of New York): I believe that in New York any person with a load of over 8 tons takes his chances on crossing a bridge, but no public official cares to take advantage of that law. Everybody feels that the bridge ought to be able to carry any reasonable load, whether the vehicle is an automobile truck or anything else of that sort.

THE CHAIRMAN: If there is no further discussion, Mr. Smith of New Jersey wants to speak on the subject of National Roads.

## NATIONAL ROADS

By F. F. SMITH

This matter of the Quebec-Miami highway was to have come up last Monday, but there has been such a crowd of other matters and papers that we had to give way. I am sorry we haven't got a larger number here today, because I feel that this is a subject that maybe some of you don't know about and will be very much interested in when you do know about it. The Quebec-Miami highway is something that is known to very few people except in the East, and I doubt whether some of the Western people have even heard of it. It occasionally crops out in the papers but nobody knows just what it means. For the first year after the formation of this commission which created the Quebec-Miami idea, it was a joke, almost, to think that there could be a road running from the upper end of our States

to the south; practically it is an international road, taking in part of Canada, and is partly governed by a board of governors who are Canadians, and it runs down through the Eastern States and the District of Columbia to Florida as well as through a considerable section of Canada, and consequently it is practically an international road. It was created in this way. Nearly four years ago the New York *Herald* and several other papers got busy and tried to start a road in the South, partly as an advertisement of the New York *Herald* and an Atlanta paper, and they formed a little committee and called it the National Highway. It started from New York and went out through New Jersey and Pennsylvania to Gettysburg and through the mountains of Virginia and was later on continued to Jacksonville, but it is a road that is practically on paper, because it was never found feasible. The Glidden tour went over it, but it had a terrible time. It is rather an impracticable route, because it goes through the mountains of Pennsylvania and Virginia and then on through a wild region where there are no hotels and where tourists have no means of taking care of themselves on the route. The southern part of this road was part of the capital highway from Richmond down and it was a Richmond road. The latter part was never graded and is practically a hog wallow although fenced in and called a road. Three years ago some of us got together and said, "There ought to be a road from the north to the south, because it is needed." We got a committee together and went over the route and picked out a route we thought might be good. At the meeting in Richmond two years ago we formed a definite commission of 30; five Canadians were present there, embracing those gentlemen who spoke this morning, and there were two representatives from each of the ten States through which the road passed and two from the District of Columbia. We dignified ourselves by the name of the Quebec-Miami Highway Association and said we would work without any pay and bear our own expenses for two years. I happen to be a retired manufacturer and have plenty of time. We could not, of course, build the road; we merely compiled the road, just as you'd go to your library and pick out a book and read an author on one particular subject. We got together in three or four different meetings and formed committees from different sections of the country. I have been over the whole route. During May and April I drove up from Miami to Philadelphia, and then in the summer up to Montreal. Josh Billings our great American humorist once said that the hen is a wise bird because she never cackles until after the egg happens. We don't cackle about this thing but the road is nearly done and it is a surprise to ourselves as well as to others that we have been able to accomplish what we have. They say the secret of John Wanamaker's success is not in doing things himself but in making the other fellow do it. We made up our minds to find the missing links and persuade the county officials to do the work we wanted done to connect the route up, and we succeeded. We have



not spent a great deal of money and have not gone into debt. We found out there were a series of roads, for instance, a little piece of road from Montreal to Quebec is not finished and will not be before next year, but from Montreal down there was a continuous highway, the old stage route following the Hudson River. As we got down to New York, we struck another road built one hundred and fifty years ago from Boston to Baltimore, and we used a portion of that. Further down we found short post roads that had been established, some of them one hundred and fifty years ago, so we tried out the different ones until we got some that were pretty good and persuaded the counties to put in the little connections, and now we have a continuous road, although it is not quite finished. The hen has cackled a little early perhaps, but this is going to be a road that will be very popular and useful for different purposes. It is a very scenic road, as you follow it from the Adirondacks down the Hudson, all the way down to New York, then it crosses the Hudson and goes through the Oranges of New Jersey into Pennsylvania down to the upper Chesapeake and takes in a historic route from Richmond to Washington. There are twenty-seven battle grounds on the route within a hundred miles. Further down it goes through the pine regions, Pinehurst and several other resorts used by our people in the winter, and at the same time it connects all these capitals, Richmond, Savannah, Augusta and there are twelve large cities on the route and over fifty good sized towns and dozens of small villages. It goes through a thickly populated region, and geographically it is right. If we went as far back in the mountains as the red line shows, we would find that we got snow in November and as late as April; if we go near the coast, we would find that in the whole route there isn't a hill 100 feet high and there is not a grade over 5 per cent, and there is a good hotel every 50 miles. It will bring the Southern people in the summer to the mountains and lakes and connect all those principal cities and result in a great mercantile traffic. Starting here we have the line finished from Montreal to Washington, with the exception of 10 miles that will be done this fall, practically nearly all a stone road, a little in New Jersey that takes in gravel roads and a little piece farther down that takes in cement roads, but practically it is a stone road. Further down, it takes up the gravel roads through Virginia, and further the sand clay roads. When it strikes Pinehurst, there are 1500 miles of side roads all through the mountains that Mr. Tufts and his associates have built, pleasure drives. In Georgia we strike magnificent roads, hundreds of miles of them continuously. Once in a while we strike a little gap. We have had several very difficult places to overcome. One was a little place in Maryland, only 10 miles had been washed away, built one hundred and fifty years ago, washed sixty years ago and never rebuilt, and finally we tore it all out and put in a new road and it's a sunk-way now; we have just put in a real good cement road costing \$80,000 for 60 miles of it. Further down we had another difficult place in North Carolina where

the log camps shut out the automobiles and wouldn't let us come through their camp, so we had to make a little detour, but we are going to build that 6 miles there right through the county in trestle work, if necessary, and go over the log fellows. Further down in Georgia we struck a swamp so impenetrable that we could not get through and couldn't even build a bridge there. Lately, however, they put a large bridge there right across, resting on the islands, and the railroad companies have made a contract with us for ten years to carry our cars across that place on flat cars at \$2. We have no more difficulties except that in two or three places we have ferries in Florida that will be replaced with bridges. The great advantage of this route is that it connects the North and the South and does everything to make good feeling. We find that the tourists are going to Florida a great deal more than they did, because they can take their cars and have something to amuse them. We have 1800 miles of real good roads finished in Florida, drives that would please the Northerners so much they would always want to go to Florida. Following the drives of 400 miles from Miami to Jacksonville, this whole route is 2400 miles from Quebec to Miami, and there is only about 100 miles of it not yet in good condition. You can go over the whole route as it is, but by next year all those little gaps will be finished, and by next November you will be able, with comfort, to average 100 miles a day easy. I did that coming up. I speak of this today from the fact that we are having so much interest in this convention about how to build roads and what we are going to do and what is going to happen to the roads. Here we have got something that has actually been done, and the fruit of one of these conventions. When we held that convention in Richmond two years ago, we did not think we could do such a thing as this, yet we did it and did it so quietly that few people realize it has been accomplished. So I believe there is work being done over this country that you could take a lesson from; we get all these ideas from one another; you can take up a little road of 10 miles here and 20 miles there and get busy and accomplish these things by united effort and occasionally by bluff. We got hold of one county there that wouldn't do anything, would hardly let the road come through there. We said, "All right, we don't care, we will go down through the next county," and we started to build a road and they immediately came to the scratch and put up the money. There are several cases where we made them do that. Some would say, "That's a hot air road;" and so it is, in one sense, we did it by talking and persuasion with other people and made them do what we wanted them to do and it was not a hard job either when we got right down to business. Somebody said hot air is a thing that could be laughed at, but you remember the old hen laid over 3,000,000,000 eggs last year and two-thirds of them were hatched out with hot air in incubators. I don't know that there is much more to say about this. I could go right on telling stories about it. We have adopted a system—



we have not yet finished the work, we have now got to do the finishing up of these little places and then we have got to mark it off and we are going to have a very perfect system of marking by the color scheme. There are some of the New York State roads that we see in this route that have adopted the color system of painting the telegraph poles with yellow, blue or green according to the different routes. We have adopted a yellow and black band with an arrow, and all you have got to do in spinning along the country roads, night or day, is to follow your arrows and not bother with signs or anything of the kind, and we will have a book describing the route and will arrange with the hotel people so we can get a maintenance fund and keep a patrol and the hotel keeper will take it up and subscribe to these books and pay a certain amount towards keeping up the road, but you understand this road is not for the automobile people and tourists only, the principal use of this road will be for local use between different points and for mercantile purposes, for trade and the use of farmers. There is an immense amount of farming being done in Florida, Georgia and North Carolina and it was a great surprise to me, I never had any idea what a beautiful country there was between here and Florida until I went through it by automobile and passed through the village streets themselves instead of passing merely through the railroad depots. So people who want winter pleasure can take their car and go South and thoroughly enjoy it, and it will cost them less than it would to stay at home, almost, because everything is so cheap in the South. Living is cheap. You can use your summer clothing and live there cheaper than at home. This is an interesting subject and a subject that I think this convention ought to endorse, a subject it should take up and look into. We hope you will be interested enough in it to travel over this route when it is done and ask more questions about it and make yourself thoroughly familiar with the Quebec-Miami highway. I thank you very much for your attention.

THE CHAIRMAN: Is there any point any gentleman desires to enquire about or discuss in reference to Mr. Smith's road?

A DELEGATE: How wide is it?

MR. SMITH: That varies in different places. We merely used the roads which were built, 40- and 50-foot roads in most cases. In some cases in the south they do not build their roads quite as wide and they run down to 30 feet between banks, sometimes 30 feet between fences; the road itself is 16 feet, and in some cases they have laid the pavements 8 or 9 feet wide and laid turf and grass on the outside so that you can turn out. It is not a uniform, standard road. The upper part is a stone road, from Richmond north, and below that, gravel. Further south you get the clay and the shell roads and in Florida a great many phosphate roads. I can show

you roads which are like a looking glass, they are so smooth and hard, but in other cases they are the ordinary country roads made better. We cannot say that they are the best roads all the way down, but they are better roads than the average country roads in the North, so much so that you can travel anywhere on them with ease and comfort.

A DELEGATE: Isn't it sand roads on the east coast of Florida above Miami?

MR. SMITH: Very little of those left now, they are brick roads in some places and in other places shell roads; in other places rock roads.

A DELEGATE: Does it go through a rock ledge or mountains? I know that country; I made an examination of it myself a few years ago.

MR. SMITH: We have a great deal of that road finished now that is thoroughly good. Well, the last 200 miles down to Miami are now all finished rock road and oiled, made with coquina rock, finished last year, ground up coquina rock and rolled and scraped and oiled.

A DELEGATE: Don't it go to pieces when it gets wet?

MR. SMITH: No, since they have oiled it, it doesn't hurt it much.

A DELEGATE: Mr. Flagler is having trouble with his extension now because the material slips and slides in the water.

MR. SMITH: I don't think they have any trouble that way.

A DELEGATE: Last year they had trouble keeping it up where they filled in at the trestles.

MR. SMITH: The worst thing is that they injure the surface sometimes with those heavy trucks they have, they are using very heavy trucks. I passed through one field of 1000 acres of pine-apples and they are hauling a tremendous amount of stuff to the depots and the canning factories, but they keep it in repair.

A DELEGATE: When they strike the river going down in automobiles is it arranged so we can get across without having to wait a day or two?

MR. SMITH: There is only one place where you have to wait, and that is Rockledge; there is a small ferryboat there which carries only two cars. It will be arranged this year so as to carry more cars. Still, a tourist does not mind a little wait. You can go in



## RESOLUTIONS ADOPTED

The Committee on Resolutions, appointed by Hon. Logan Waller Page, president of the Congress, submitted the following report, which was unanimously adopted:

WHEREAS, The loss by reason of bad roads which everywhere lessens the profits of industry, increases the cost of living, and burdens business enterprise, amounts to millions annually, therefore, be it

RESOLVED, That the American Road Congress earnestly favors the creation of a national department of public works, directed by a secretary, who should be a member of the President's cabinet.

RESOLVED, That the American Road Congress favors State highway commissions and State aid for the construction and maintenance of the main roads of the several States.

RESOLVED, That the American Road Congress favors the establishment of a national road system, and favors the construction by the States, counties, and towns of the lateral and connecting market highways.

RESOLVED, That the American Road Congress respectfully requests the Congress of the United States to authorize the President to appoint a commission from civil life, with sufficient appropriation to make a thorough and exhaustive report on, and to recommend a system of Federal aid.

RESOLVED, That the American Road Congress respectfully petitions the Congress of the United States to adopt the necessary legislation, so that the United States may hereafter be officially represented at the International Road Congresses.

RESOLVED, That the American Road Congress favors the investigation by the United States Office of Public Roads of applications for patents affecting road and bridge construction before letters patent are issued.

RESOLVED, That the American Road Congress commends the Lincoln Highway Association for its efforts in seeking the establishment by popular subscription of a transcontinental highway as an enduring and useful memorial to Abraham Lincoln, and further commends the National Old Trails Association for its splendid work in the rebuilding of the Cumberland Road and the Santa Fe Trail.

RESOLVED, That the American Road Congress emphatically endorses the compulsory use of wide tires and road drags.

RESOLVED, That the American Road Congress favors, wherever practicable, the use of convicts in road construction and maintenance.

## RESOLUTIONS ADOPTED

The Committee on Resolutions, appointed by Hon. Logan Waller

ge, president of the Congress, submitted the following report, which was unanimously adopted:

WHEREAS, The loss by reason of bad roads which everywhere lessens the profits of industry, increases the cost of living, and burdens business enterprise, amounts to millions annually, therefore, it

RESOLVED, That the American Road Congress earnestly favors the creation of a national department of public works, directed by a secretary, who should be a member of the President's cabinet.

RESOLVED, That the American Road Congress favors State highway commissions and State aid for the construction and maintenance of the main roads of the several States.

RESOLVED, That the American Road Congress favors the establishment of a national road system, and favors the construction by the States, counties, and towns of the lateral and connecting market highways.

RESOLVED, That the American Road Congress respectfully requests the Congress of the United States to authorize the President to appoint a commission from civil life, with sufficient appropriation to make a thorough and exhaustive report on, and to recommend a system of Federal aid.

RESOLVED, That the American Road Congress respectfully petitions the Congress of the United States to adopt the necessary legislation, so that the United States may hereafter be officially represented at the International Road Congresses.

RESOLVED, That the American Road Congress favors the investigation by the United States Office of Public Roads of applications for patents affecting road and bridge construction before letters patent are issued.

RESOLVED, That the American Road Congress commends the Lincoln Highway Association for its efforts in seeking the establishment by popular subscription of a transcontinental highway as an enduring and useful memorial to Abraham Lincoln, and further commends the National Old Trails Association for its splendid work in the rebuilding of the Cumberland Road and the Santa Fe Trail.

RESOLVED, That the American Road Congress emphatically endorses the compulsory use of wide tires and road drags.

RESOLVED, That the American Road Congress favors, wherever practicable, the use of convicts in road construction and maintenance.



**RESOLVED**, That the American Road Congress favors long tenure in office of experienced and efficient highway officials.

**RESOLVED**, That the American Road Congress expresses its sincere thanks and appreciation to the citizens, commercial organization, and the press of the city of Detroit, of the county of Wayne, and of the State of Michigan, for their hearty coöperation and generous hospitality towards this, the greatest of American road congresses.

## MICHIGAN DAY

### SESSIONS OF MICHIGAN STATE GOOD ROADS ASSOCIATION

October 3, 1913

*Note.*—As the proceedings were of a local character, publication is omitted, with the exception of an address on "Concrete Roads" by Frank F. Rogers, State highway commissioner, and its discussion by A. N. Johnson, State Highway Engineer of Illinois.

For further information inquiry should be addressed to Hon. P. T. Colgrove, President, State Association, Hastings, Michigan.

### CONCRETE ROADS

BY HON. FRANK F. ROGERS

*State Highway Commissioner of Michigan*

Much of value has been written in the past two years on concrete roads and pavements, but a great deal is in the nature of theoretical discussions quite largely based on laboratory experiments, hence when an opportunity is offered to make a field study of many miles of concrete roads, some of which have seen four years of service, it should not be lost.

The writer makes no claim to being a concrete expert but simply has been fortunate in having the opportunity to study at first hand, and in some detail, the behavior of a large mileage of concrete roadways in Wayne County, Michigan. This county, without doubt, has a larger mileage of concrete roadways than any other county in the United States, or than is possessed by any equivalent area under a single local government in any foreign country. There are now completed in Wayne County about 65 miles of concrete highways outside the corporate limits of cities and villages.

For reasons above stated the writer desired to spend the time allotted to him in a somewhat detailed study of the local concrete roads, which most of you will visit before leaving the city, rather than to treat the subject in a more general way. All of the main highways leading out of this city have been concreted to the outermost boundaries of Wayne County and several cross-roads have already been concreted. The principal roads are the extensions of Woodward, Grand River, Gratiot and Michigan Avenues, while River Road and the extension of Fort Street running southerly are concrete roadways that should not be overlooked.



The State highway department with the coöperation of the road officials of Wayne County and assisted by Prof. John J. Cox, instructor in highway engineering at the University of Michigan, has just taken up some detailed and rather minute observations of these roads which will extend over a period of years in the hope that after a while a safe estimate can be made of the probable life and cost of maintenance of such pavements as the county is now building, and under such traffic, soil and climatic conditions as prevail in this locality.

The first work in this study will be careful traffic records covering enough time and at such frequent intervals as will give a reliable estimate of the average daily traffic for one year. The first records were taken for one continuous week beginning August 21 and a part of this record which is given in the accompanying table will be used for the purpose of the present discussion.

The next step was to start a permanent record showing the present condition of each 25-foot section (the distance between expansion joints) of all the different roads. The observations for this record were made September 2, 3 and 4 and cover 6384 sections and a little over 30 miles of road. Several pieces of road have not been taken at this time. The oldest roads were built in 1909 and the newest that were taken were built in 1912, having been down one year.

For the purpose of this record the defects in the slabs or sections have been classified as longitudinal, transverse and diagonal cracks and holes. The records were taken in ordinary field books, the left hand column of the left hand page having been previously numbered with an automatic numbering stamp to designate the record number of each slab, while the four columns to the right were headed L—T—D—H, respectively, being the first letters of the words indicating the defects named. Opposite each number and in the proper column vertical, horizontal or diagonal marks were used for symbols to indicate the form of the crack, while small ovals were used to indicate such holes as seemed worthy of note. Tar had been spilled on many spots that were not defective.

#### WOODWARD AVENUE ROAD

The first mile of this road was built in May and June, and opened to traffic in July of 1909, thus giving it full four years of wear. The traffic record of this road shows a daily average of 2160 vehicles, of which 88.1 per cent were motor driven.

The soil is clay loam, inclining a little more to sand at the northerly end. A double track electric railway occupies the westerly side of the street. Between the railway and the concrete roadway is a very shallow gutter under which was laid a tile drain from 2 to 3 feet in depth. On the opposite side is an open ditch, the bottom of which is from 2 to 4 feet below the crown of the roadway.

The pavement is 18 feet wide, has a crown of 3 inches and a blind curb 8 inches wide and 4 inches deep under the outer edges which were somewhat beveled. The concrete was composed of Portland

cement, crushed field stone or cobbles and sand mixed in the proportion of 1:2½:5 for the base which was 4 inches thick. The top layer was made of the same materials, using a 1:2:3 mix and was 2½ inches thick.

No very definite data can be secured to determine the wear, which seems to be slightly greater on the side opposite the railway, but measuring from some of the harder pieces of the coarse aggregate which have been worn but little, if any, we have estimated the general wear at about ¼ inch which would be an average of ⅙ inch per year.

This mile was divided into sections of about 25 feet, separated by expansion joints, there being 209 sections to the mile. The most of the sections were separated by four thicknesses of tar paper separated by thin boards which it was planned to remove as the work progressed though many of the boards are still in the pavement. Four of the joints were protected by pairs of steel angle bars, separated with tar paper and placed with one leg of each angle back to back so that the other leg of each bar was flush with the surface of the concrete, thus covering a space of about 4½ inches at the joints. The concrete wears slowly on each side of the angles leaving a raised joint that is slightly noticeable when driving over the pavement. This was an experiment which has not been repeated.

Of the 209 sections constituting the first mile on Woodward Avenue, 80 showed longitudinal cracks, 32 transverse cracks and 2 diagonal cracks while 46 sections were recorded as having holes, making a total of 160 sections which are more or less imperfect, or 76.5 plus per cent of the entire mile.

The remaining portion of Woodward Avenue, 252 sections, was built in 1910 using the same materials and the same mix. No blind curb was used and the crown was reduced to 2 inches. The soil on this section is considerably more sandy, especially toward the north end.

On this portion of Woodward Avenue, 29 sections have longitudinal, 22 sections transverse, and 6 sections diagonal cracks. 11 sections have holes, making a total of 68 defective sections or 27 plus per cent as compared with 76 plus per cent in the first mile.

#### GRATIOT AVENUE

On Gratiot Avenue in the season of 1910, 9000 feet of 16 foot concrete roadway was built. On this pavement gravel and sand were used for the aggregate and a one layer concrete having a 1:2:4 mix was laid. The soil is a clay loam and rather heavy. This road was not completed until late in the season and was opened to travel in November. It immediately pitted and looked rough and has been covered with a surface treatment of refined tar and fine gravel. It was re-covered this season, using a rather light grade of tar (Tarvia A) but it already shows some tendency to scale off. The experience in some other places leads the commission to believe that a heavier grade of tar gives better results.



Beyond this portion of the roadway 326 sections of the same width concrete laid in 1911 reaching to the county line. Washed pebbles and sand were used for the aggregate in a  $1:1\frac{1}{2}:3$  mix, one course concrete 7 inches deep being laid. The records for this piece are as follows: Longitudinal cracks, 11; transverse cracks, 10; diagonal cracks, 3; holes, 6; showing a total of only 30 defective slabs or 9.2 plus per cent. The traffic count on this road, taken at the county line, shows 507 vehicles daily, 65.8 per cent of which are motor driven.

#### GRAND RIVER AVENUE

On the Grand River Road 61 sections of two course concrete, the same as laid in the first mile of Woodward Avenue, were built in 1909. The soil is a clay loam. The records show 11 longitudinal cracks, 2 transverse cracks, 1 diagonal crack and 3 holes, a total of 17 defective slabs or 27.9 minus per cent. The traffic count showed 1064 vehicles, 56.5 per cent of which were motor cars.

In 1910, 341 more sections were added to Grand River Avenue under contract, the specifications being the same as for the north end of Woodward Avenue. 33 of these slabs became more or less pitted, some having quite large holes. They have been repaired by covering with refined tar and stone chips so that no defects could be observed at the time of the count, hence only 308 are shown in the table. The defects noted are as follows: 59 longitudinal, 20 transverse, 29 diagonal cracks and 46 holes, a total of 154 defective slabs or 50 per cent.

In 1911, 515 additional sections of one course concrete were placed on the Grand River Road. Washed pebbles and sand were used for the aggregate with a  $1:1\frac{1}{2}:3$  mix. The Baker steel joint was used in all of this work except the first six sections. The defects noted are as follows: Longitudinal cracks, 8; transverse, 26; diagonal, 3; and holes 5, making a total of 42 defective sections or 8.2 plus per cent.

In 1912, 1208 more sections were added to Grand River Avenue reaching to the line between Wayne and Oakland Counties. The count on these sections shows as follows: 66 longitudinal cracks, 37 transverse cracks, 6 diagonal cracks and 5 holes, making a total of 114 defective sections or 9.4 plus per cent. The soil grew more sandy as the road extended westerly, considerable stretches being almost free from clay or loam.

#### MICHIGAN AVENUE

On Michigan Avenue 481 sections of concrete, 17 feet 8 inches wide were laid, using washed pebbles and sand for the aggregate in a  $1:2:4$  mix. The soil for the most part is a sandy loam, but a little heavy. The count shows as follows: 219 longitudinal cracks, 48 transverse cracks, 23 diagonal cracks, 21 holes, making a total of 311 defective sections or 64.6 plus per cent. The traffic count shows 1009 vehicles, 67.5 per cent of which were motor driven.

In 1911, 1570 sections were added to this piece of road, using washed pebbles and sand for the aggregate and a 1:1½:3 mix. The soil over which this pavement was laid is a sandy loam running into light sand at the west end. The count shows the following: 219 longitudinal cracks, 80 transverse cracks, 42 diagonal cracks, 14 holes, making a total of 355 defective sections, or 22.6 plus per cent. In 1912 this road was paved to within 1½ miles of the county line, and this year completed to the county line, but no record was taken farther west than the east limits of the village of Wayne.

#### RIVER ROAD

In 1910, 149 sections of concrete 15 feet wide and 6½ inches deep were laid on the River Road, using gravel and sand for the aggregate and a 1:2:4 mix. The soil over which this road runs is for the most part heavy clay. The count shows as follows: 49 longitudinal cracks, 5 transverse cracks, 6 diagonal cracks and 2 holes, making a total of 62 defective sections or 41.6 plus per cent. The traffic count shows 538 vehicles daily, of which 78.9 per cent were motor driven.

In 1911, 434 sections were added to this road some distance below the village of Trenton. The pavement was 15 feet wide, 7 inches thick, built of washed pebbles and sand for the aggregate, using a 1:1½:3 mix. The count for this stretch of road shows as follows: 16 longitudinal cracks, 17 transverse cracks, 13 diagonal cracks and no holes, a total of 195 defective sections or 44.9 plus per cent.

In 1912, the gap between this piece of road and the southerly limits of the village of Trenton was closed in with a similar pavement to that just described, comprising 213 sections. The count on this piece shows defects as follows: 14 longitudinal cracks, 8 transverse cracks, 4 diagonal cracks and no holes, making a total of 26 sections or 12.2 plus per cent.

The same year there was added to the south end of the work done in 1911 something over two miles of concrete roadway, but of this only 208 sections were counted. Of the sections counted, 17 show longitudinal cracks, 9 transverse cracks, no diagonal cracks and no holes, a total of 21 defective sections or approximately 10 per cent. The soil of the entire road was heavy clay.

#### FORT STREET ROAD

In 1910, one-half mile of gravel concrete of a 1:2:4 mix, 12 feet wide and 6½ inches deep was built on Fort Street. This concrete like that already referred to on Gratiot Avenue was built rather late in the season and was opened to traffic in November. It immediately pitted to such an extent that it has since been coated with refined tar and fine washed gravel, about ½ inch in size. This covering makes an excellent surface and wears fairly well. Of course it was impossible to observe any further defects in the concrete at this time. Continu-



ing south, in 1912, 450 sections of concrete 12 feet wide, 7 inches deep, and of 1:1½:3 mix were added. The count on this piece of road follows: Longitudinal cracks, none, although another observer has reported there are 2, transverse cracks, 19; diagonal cracks, 9; and holes, 1. Total defective sections, 29, or 6.5 minus per cent.

From the foregoing, it is strikingly apparent that the percentage of defects varied greatly in the different roads. A careful study of this variation in connection with the age of the pavement will soon convince one that mere age has not produced the defects noted. For example, 252 sections built on Woodward Avenue in 1910 show but 27 per cent defective slabs, while 308 sections built on Grand River Avenue, the same year under the same specifications, show 50 per cent of defective slabs. There are two noticeable differences. Grand River Avenue was built by contract on a clay loam soil while the portion of Woodward Avenue named, was built by day labor under the direct supervision of the engineers of the county road commission, on a soil more sandy and, presumably with a little better sub-drainage. Again 481 sections built on Michigan Avenue the same year with sand and pebbles for the aggregate and a 1:2:4 mix show 64.6 per cent of defective slabs. This was on clay loam soil. We might also mention 149 sections built on the River Road in 1910 on heavy clay soil, under the specifications last named, which show but 41.6 per cent of defective slabs.

The most noticeable feature concerning these defects is that the longitudinal cracks almost always appear in groups, seldom singly. This indicates that there must be some local conditions in the foundation, due to insufficient drainage, soil conditions, newly made fills or uncompacted sub-grades that cause these defects. Longitudinal cracks almost invariably appear on fills and on cuts, apparently with as much frequency in the latter as in the former. It would seem that cracks on the fills are due to the settlement of the embankment, and in the cuts the presence of water and frost in the sub-grade. Briefly, the writer's opinion is that these cracks are due, first, to the settlement of the newly made fills, and second, to water that has not been completely removed from the sub-grade, plus frost. If these causes could be thoroughly eliminated it would seem possible to build concrete roadways to the width of 15 or 16 feet, where sufficient expansion joints are used, without fear of trouble from longitudinal cracks.

It has been argued by the Morse-Warren Engineering Company, in a recent publication, that it is impossible to build concrete pavements (wider than 12 feet) which will remain free from longitudinal cracks without using longitudinal joints, unless the pavement is so thick as to make the price practically prohibitive. The table accompanying this report which shows 450 sections of 12 feet roadway on the Fort Street Road would seem to bear out this assertion, but a mile of concrete on the Eureka Road, which the writer did not get time to inspect, shows a great number of longitudinal and transverse cracks, in a 12

foot concrete roadway, where the soil conditions are the same as on the Fort Street Road referred to. The only apparent difference is that the former is a 1:2:4 mix and the latter a 1:1½:3 mix, washed pebbles and sand being used for the aggregate in both cases.

But long stretches of pavement 16 feet wide and now two years old on Grand River and Michigan Avenues, which show no longitudinal cracks, would seem to prove that this statement is not necessarily true and that a sufficient amount of money spent in compacting and draining the foundation or in reinforcing the concrete over newly made fills, would produce pavements free from the objectionable longitudinal crease, whether natural or artificial. Most persons are agreed that transverse cracks are almost always due to defective expansion joints. It has been thoroughly demonstrated, both theoretically and practically, that 25 feet is frequent enough for the expansion joints, and it is quite possible that they might be placed farther apart with safety,—probably not less than three to 100 feet.

The diagonal cracks are doubtless due to causes which are a combination of those noted under longitudinal and transverse cracks. Many diagonal cracks were noted where the corners only were broken off, frequently on adjoining corners of adjacent slabs, indicating that the slabs were united through the expansion joints with a bond stronger than the tensile strength of the concrete on either side of the joint.

The holes noted are perhaps of less importance than the different kinds of cracks. In a few instances they are rather large, sometimes a square yard or more in area, but such places are very rare and most of the holes noted are due simply to some foreign substances getting into the concrete, like clay, wood or some fragment of an inferior rock that might chance to be a part of the aggregate. This was more noticeable where crushed cobbles were used for the coarse aggregate than where washed pebbles were used.

Any one familiar with the quality of rocks which constitute Michigan cobbles will understand that the principal objection to this material for an aggregate on concrete roads is the varying qualities of these rocks, ranging from soft to hard granite, quartzite and trap. A study of the roads where these materials have been used shows much more wear in the spots where the softer rocks happen to be at the surface.

Up to the present time the defects noted, except the pitted conditions of the concrete roads which have been re-surfaced in the manner already described, are not serious and are not causing any additional expense for up-keep. In the past two years the expansion joints on all the old work, whether reinforced or not, have been coated with refined tar and sand once a year. Thus far, the cost has ranged between \$50 and \$100 per mile, depending on the distance of the work from the base of supplies. These repairs are proving adequate and satisfactory, and while the defects noted are something of a reflection on the present method of building concrete roadways they are really



no reflection on the use of concrete as a suitable material for making hard and durable surfaces over our country highways wherever traffic conditions warrant, and the community has the ability to pay the cost of high class road surfaces. There is no question as to the necessity of some form of very permanent roadway near the city of Detroit, neither is there any question as to the ability of Wayne County to pay for roadway that is good enough and permanent enough to meet the requirements of its traffic. In the writer's opinion, Wayne county has made no mistake in choosing concrete as a paving material for its main roads.

MR. A. N. JOHNSON: All who are interested in the problems of road construction, particularly of concrete roads, are indebted to Mr. Rogers for the very valuable data that he has presented in his excellent paper, for it is only by the intelligent collection and presentation of such data that true progress in the art of road making can be made.

With so many conflicting reports afloat as to the condition of the concrete roads of Wayne County, it is particularly refreshing to have before us so concise and reliable a statement concerning them. As Mr. Rogers points out, the general condition of these roads is excellent, but as more information is usually to be gained from a study of the defects in any work, this discussion will have mainly to do with such defects and their causes and to suggest such remedies as seem to be applicable.

Mr. Rogers' paper classifies the defects noted in the Wayne County roads under four heads; longitudinal cracks, transverse cracks, diagonal cracks and holes or pits in the road surface. It remains to be seen whether the exact causes and consequently the proper remedies for these defects can be determined from our present knowledge. The last of these defects will be discussed first, as there is probably less doubt as to the causes.

It is evident that if one portion of a concrete road surface, under given conditions of traffic, exhibits a special weakness, it must be due to non-uniformity of the concrete. This will happen if soft pieces of material are in the aggregate. Many gravel banks contain enough soft pebbles to render the gravel useless for concrete road work, though frequently these soft pebbles have somewhat the general appearance of the sound material and, unless a careful examination is made, will not be detected.

Another cause for local weakness in concrete is the un-uniform distribution of the mortar and the aggregate. It frequently happens, particularly with very wet mixtures, that the coarser aggregate will not be thoroughly distributed, but will occasionally be separated into small collections or nests of the larger pieces, which contain a very small amount of mortar. There is no mixer that has come under the writer's observation which will mix a batch so uniformly and deposit it in the road so that all portions will contain the proper

amount of coarse aggregate and mortar. It is necessary, therefore, in the construction of a concrete road to have one or two men constantly at hand to correct such uneven distribution by shoveling out the pockets of coarser aggregate to be found in the center of nearly every batch that is deposited on the road and replace these pockets with mortar, which usually runs to the bottom and edges of a batch. Where the holes or pits in the road surface are few, their cause is probably due to one or both of the above mentioned reasons.

Where the surface exhibits a more general disintegration, it will usually be found due, assuming a rich mixture has been used, either to the concrete drying too fast during the period of setting, thereby not curing properly, or because it has been frozen while setting. It is assumed in this discussion that a rich enough mixture has been employed to insure good concrete, although most complete failures of concrete roads are due to a too lean mix and poor workmanship. All of these causes are generally well understood and most specifications and approved workmanship seek to avoid them.

The causes of the first three defects noted by Mr. Rogers are perhaps more difficult to ascertain in a given instance. Before taking up the discussion of the causes, it is of advantage to rearrange the data as presented. This has been done by grouping the data according to the year in which the roads were built, or in other words, according to the age of the various pieces of road. And in order to have a proper basis of comparison, the number of cracks per mile has been computed for the roads built in 1909, 1910, 1911, and 1912, respectively. The results are presented in the following table:

TABLE 1  
*Showing the cracks per mile for each year*

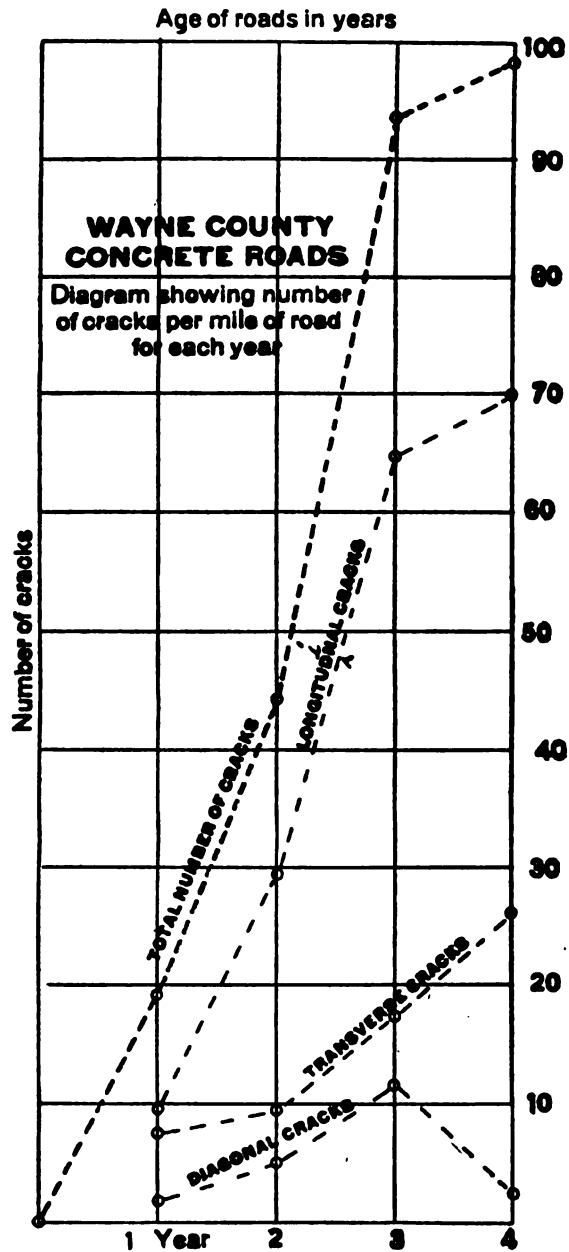
	CRACKS PER MILE			
	1912	1911	1910	1909
Transverse.....	7.4	9.9	17.3	26.2
Longitudinal.....	9.8	29.8	64.8	70.0
Diagonal.....	1.9	4.5	11.7	2.3
Totals.....	19.1	44.2	93.8	98.5

The results in this table are represented graphically in figure 1, where the age of the pavements in years is plotted as abscissas and the number of cracks per mile as ordinates.

At a first glance, one is struck with the increase in the number of cracks with each succeeding year. This increase is particularly marked during the first three years, but apparently falls off sharply during the fourth year.

A notable coincidence is that the curve showing the total number of cracks per mile of all kinds is approximately a straight line for





the first three years, or in other words, the increase in the number of cracks was approximately the same for each of these years.

There is also considerable agreement of the curves for the longitudinal, transverse and diagonal cracks during the first three years, but no such agreement for the fourth year. It is to be borne in mind, however, that for the fourth year, data are given for only two pieces of road about 1.3 miles in length. However, as these were laid with a leaner mixture than much of the other work and is the first concrete work done by the Wayne County commissioners, all the evidence would point to the conclusion that this stretch of road would show at least as many defects as will appear later in the other roads. But whether the conclusion can be definitely drawn that after the first three or four years but few more cracks will appear must rest on much more extended and detailed data than are to be had at present.

The value of future observations to be made at intervals of not less than three months will be evident. These observations should note carefully all the cracks that are found, both as to their character and particularly as to their distribution, so that in the future, the location of new cracks as they appear may be known, as well as approximately the time of the year when they occur. It is believed that the data secured from such observations extending over the next two or three years would shed much light on what at present can be but mere conjecture.

Before the arrangement above described was made of the data presented, many other bases of comparison were undertaken with a view to ascertain whether any particular feature had a special bearing on the occurrence of the cracks. There was not, however, disclosed anything on which conclusions could be logically based. Neither the width of the road, the proportion of the mixture nor the character of the sub-soil presents any unfailing influence on the defects noted. About the only consistent result to be disclosed was by the arrangement here made.

It may be profitable, however, at the present time to discuss the causes that may be assigned to the development of cracks in concrete roads, basing the observations on the data obtained from the conditions reported on the Wayne county work.

It can be fairly assumed in the present instance that the slabs of concrete may be considered as approximately of the same strength and therefore offer practically the same resistance to all exterior forces to which they are subjected.

Among the forces which would cause the slabs to crack are variations in temperature, extraordinarily heavy traffic loads and unequal settlement of the foundations. It is more than probable that the cracks are due to no one of these causes alone, but rather to their accidental combination. If the changes in temperature were the prime cause, it could be expected that all slabs would show approximately the same number of cracks for the reason that all



portions of the road are subjected approximately, to the same temperature variations. But an examination of the roads shows many slabs in continuous stretches which have not cracked at all, regardless of the age of the road. It can therefore be concluded, that temperature changes alone, are not sufficient to cause cracking of the slabs in general.

While extraordinarily heavy moving loads may not be so generally applied to all the slabs, and therefore not cause as uniform an appearance of cracks, yet if this be a principal cause, it could be expected there would be a large number of contiguous cracked slabs. But there is practically no evidence to indicate that there have been loads heavy enough to cause the pavements to crack from this reason alone.

The third cause that has been mentioned, that of unequal settlement of the foundation, is one that would not be generally distributed, for while settlement might occur in one place, there very likely would be considerable distances where it did not occur. Moreover, it will be appreciated that the manifold conditions which would produce unequal settlement would cause an erratic occurrence of any results from this source. And the haphazard occurrence of the cracks would indicate that the cause is not general throughout the length of the roads. The writer is therefore of the opinion that the majority of the cracks are due primarily to unequal settlement of the foundation or sub-soil beneath the broken slabs.

It is quite possible that settlement by itself would perhaps not be sufficient to cause the slab to crack, but on the passage of heavy traffic or with the movement of the slab under temperature changes, there would be added just enough extra stress to overcome the strength of the slab and produce the crack. If, therefore, it is possible in the construction of concrete roads, to guard against unequal settlement of the foundation, one of the chief sources of cracks in the pavement will be overcome.

The writer has observed that the concrete slabs composing a concrete road, usually do not crack until after they have been in service about a year. The first cracks generally appear during the late spring and early summer following construction. An explanation is that during the winter and early spring, the ground is well saturated with moisture which during late spring and early summer dries out and, in case the road bed should dry out unevenly, the consequent settlement would not be uniform.

It is, therefore, particularly important if large concrete slabs are to be maintained intact, to take special precaution with the under-drainage to protect the road bed from becoming saturated and provide a means for thorough and uniform draining of the entire road bed.

It is probable, as further studies are made, that the causes producing transverse cracks will be found to be somewhat different from those producing longitudinal cracks. One special cause of the latter is to be found whenever a concrete road is built over a hard roadbed, the

concrete slab being somewhat wider than the compacted center of the old road. The soil at the sides which is not so compact as the center, will settle more, causing the concrete slab to break longitudinally, with the road. To prevent this, it is recommended that the old road bed should be thoroughly loosened and then re-rolled with the sides so as to produce as nearly uniform a condition as possible, of the entire road bed beneath the concrete.

It is to be noted that on all the Wayne County concrete roads, the distance between the joints is 25 feet. Mr. Rogers suggests that a somewhat greater distance may be used.

It has been the writer's experience, that it is not necessary to place expansion joints as close together as 25 feet. It will be readily admitted that the fewer joints, the more desirable the road surface. The following data will perhaps be interesting in this connection, although too meagre to draw very definite conclusions.

On three pieces of work constructed under the writer's supervision in 1912, totalling 2.3 miles, none of the sections was less than 50 feet in length, many of them being 60 and 75 feet and one or two as long as 100 feet. The number of cracks per mile in these roads at present is, transverse cracks, 9.1; longitudinal cracks, 9.1. As none of the cracks have been classed as diagonal cracks, the total number of cracks per mile is 18.2, but it will be noted in Table 1, that the total number of cracks in the 1912 work on the Wayne County roads, using 25-foot sections, is 19.1. If therefore, with 50-foot sections and greater, there are no more cracks per mile than with 25-foot sections, it is evident that we do not need joints as often as 25 feet and when we consider that every joint is really a crack which must be cared for and maintained, it is evident that their reduction is a very substantial gain, both in first cost and subsequent maintenance. However, it will be necessary to have much more data, extending over a much longer time before it can be definitely concluded as to how frequent the joints should be; but from the observations that have been made it seems that the joints may be made further apart than 50 feet, rather than nearer together.

Before concluding, the subject of the mixture to be used should be touched upon. A concrete proportioned 1-2-3½ is amply rich enough to give the requisite strength required for road service. It is to be noted that this mixture provides sufficient sand to furnish a quantity of mortar approximately 60 per cent of the volume of the coarse aggregate. As was pointed out by the writer in a paper on concrete road construction, presented last year, to the American Road Congress, it is important that if all the aggregate is to be well surrounded with mortar, that with aggregate showing 50 per cent voids, the sand should be in excess of one-half the volume of the coarse aggregate. Actual service has demonstrated the value of proportioning concrete in this manner, rather than using a 1-1½-3 or a 1-2-4 mixture.

Lest a wrong impression should be gained from the emphasis laid upon the defects found in the Wayne County roads, the writer



would state in conclusion that the average crack in a concrete road is but a minute affair and is easily and cheaply filled with pitch so as to present to traffic an unbroken road surface. And from a number of personal inspections made of the Wayne County roads, he feels that the Wayne County commissioners have amply justified their adoption of this form of construction and deservedly merit the approval bestowed upon them, not alone by Wayne County citizens but by all who appreciate skillful and painstaking construction of public work.

## AMERICAN ROAD CONGRESS

Detroit, October 4, 10 a.m.

President Page in the Chair.

THE CHAIRMAN: The meeting will please come to order.

SECRETARY PENNYBACKER: The principal business of this morning is the consideration of invitations from various cities for the 1914 and 1915 American Road Congress. The committees representing the two organizations, the American Highway Association and the American Automobile Association, conferred with the gentlemen representing the various cities, on Thursday, and have gone over the various communications and the verbal information rather thoroughly, and as there are a great many telegraphic invitations and letters, the committee hardly thought it worth while to have them all read at this particular meeting. The committee has determined to withhold its final decision for a few weeks until a representative of the Congress could personally inspect the facilities for meeting places, exhibits, hotel accommodations, etc., of the various cities that might be selected. The committee does not mean by this that a tour of the whole country will be made, but they will have an inspection made of the three or four cities which they have determined upon in the final analysis, and unless there are some special communications that it is desired be read, these will be made part of the official record and not be read at this meeting.

THE CHAIRMAN: If there is no objection to placing these various requests and invitations in the record, we will allow them to go in the record. If there is any one present representing any city that desires our congress to be held there and has anything special to say on this subject, we will be very glad to hear from them.

(Representatives of various cities then presented invitations, together with arguments why the Congress should meet in them, after which the Congress adjourned.)



## MEETING OF AMERICAN HIGHWAY ASSOCIATION

Detroit, October 2, 8 p.m.

President Page in the chair.

The meeting was called to order by the president after which the secretary read the minutes of the last meeting, which was held in Atlantic City, New Jersey, October 3, 1912.

Upon motion the minutes were approved as read.

There being no unfinished business Mr. Batchelder moved that a committee of seven on nominations be appointed. The motion was seconded and adopted. The Chairman appointed Messrs Batchelder, Beatty, Johnson, Wilson, Kenyon, Colgrove and Goodell.

The committee then retired.

Secretary Pennybacker then submitted his report and the Treasurer's report, the latter official being absent. These reports had been submitted to the board of directors on the evening previous and approved by them. Mr. Pennybacker stated that the total membership was 1670, the largest ever recorded; that this number represented the bona fide, practically permanent membership. He called attention to the second official *Good Roads Year Book* which was brought out two months earlier than the first one and contained one hundred pages more matter as well as a number of new features. He also stated that the proceedings of the 1912 Congress had been issued and had been distributed to the members.

Upon motion the reports of the secretary and treasurer were adopted.

The president in a few brief remarks called attention to the fact that there had been a joint committee of the Senate and House of Representatives appointed to consider the matter of national aid in road building; that he felt particularly proud of the fact that the secretary of the Association had been made statistician and had done splendid work. He called attention to the further fact that the secretary had recently been selected by the government of Ontario to aid them in framing suitable highway legislation.

Upon motion of Mr. Diehl, duly seconded, the Association adopted by rising vote, the following resolution:

RESOLVED, That a vote of thanks be extended to the people of the city of Detroit and Wayne County for their splendid hospitality and helpful coöperation, and to the representatives of the press for the splendid, comprehensive and instructive publicity, which they have given to the sessions of the Congress.

While waiting for the committee on nominations to make its report, the president called upon several gentlemen present for a few remarks. The first speaker was Judge Lowe.

Judge Lowe gave a brief talk and among other things, said, "I do not know when I first began attending road conventions, but I have never attended a road convention that impressed me with its intelligence, its deep and abiding earnestness and its all round intelligence as this convention has done. I believe it is the greatest road convention ever held in this country. I will except Europe and the foreign countries because I have not had the pleasure, like Colonel Kenyon and others who are with us tonight, of attending conventions in those countries, but this convention has certainly set the pace, and I cannot, for the life of me, imagine how it is going to be possible for the next Congress to avoid taking a definite position on the question of national roads."

THE CHAIRMAN: I know that we would all be delighted to hear from Gen. Geo. J. Schoeffel.

GEN. SCHOEFFEL: I did not come here, Mr. President, prepared to speak, but to listen, and I have been surprised at the excellent work of the Congress. I was prepared to see good work being done; but certainly this has surprised me and I shall go back to New York and report to my superior officers—make a report to them that they will be very much pleased with.

The president then called upon Colonel M. V. Richards who was present as a representative of Mr. W. W. Finley, the president of the Southern Railway.

Colonel Richards gave a very interesting account of his experience, covering a number of years, to educate the people in the southeastern part of the United States to a better realization of the importance of developing public roads. He expressed his gratification at being present at the Road Congress, because, as he said, "I see here a large congregation of gentlemen from various parts of the United States, every individual a forceful factor in the good roads movement, and I am especially glad to see these people brought together, affiliated here, with this one organization, which I believe, gentlemen, is paving the way for a movement which will be of everlasting benefit to the people of the United States in advancing the development and improvement of the roads in this country."

Mr. W. T. Winn then addressed the meeting, expressing his pleasure at the success of the Congress, and in a very forceful manner urged that the next Congress be held at Atlanta, because of the intense interest being displayed by the people of the South in this great movement for better roads.

Mr. Diehl then took the chair, and the committee on nominations presented its report which was as follows: "For president, L. W. Page; for vice-president, W. W. Finley; for secretary, J. E. Pennybacker; for treasurer, Lee McClung; for field secretary and organizer, Charles P. Light; for directors for three years, Alfred Noble, J. W. Jones, T. G. Norris, James S. Harlan, L. E. Johnson, Roy D. Chapin, Charles Whiting Baker and Austin B. Fletcher.

On motion of Mr. Batchelder, duly seconded, the report was adopted.



The chairman stated that the gentlemen mentioned in the report had been placed in nomination, and Mr. Beatty moved that the secretary cast a ballot of one for the nominees as recommended by the committee on nominations. The motion was then seconded and adopted.

The chairman declared these officers elected and escorted President Page to the chair.

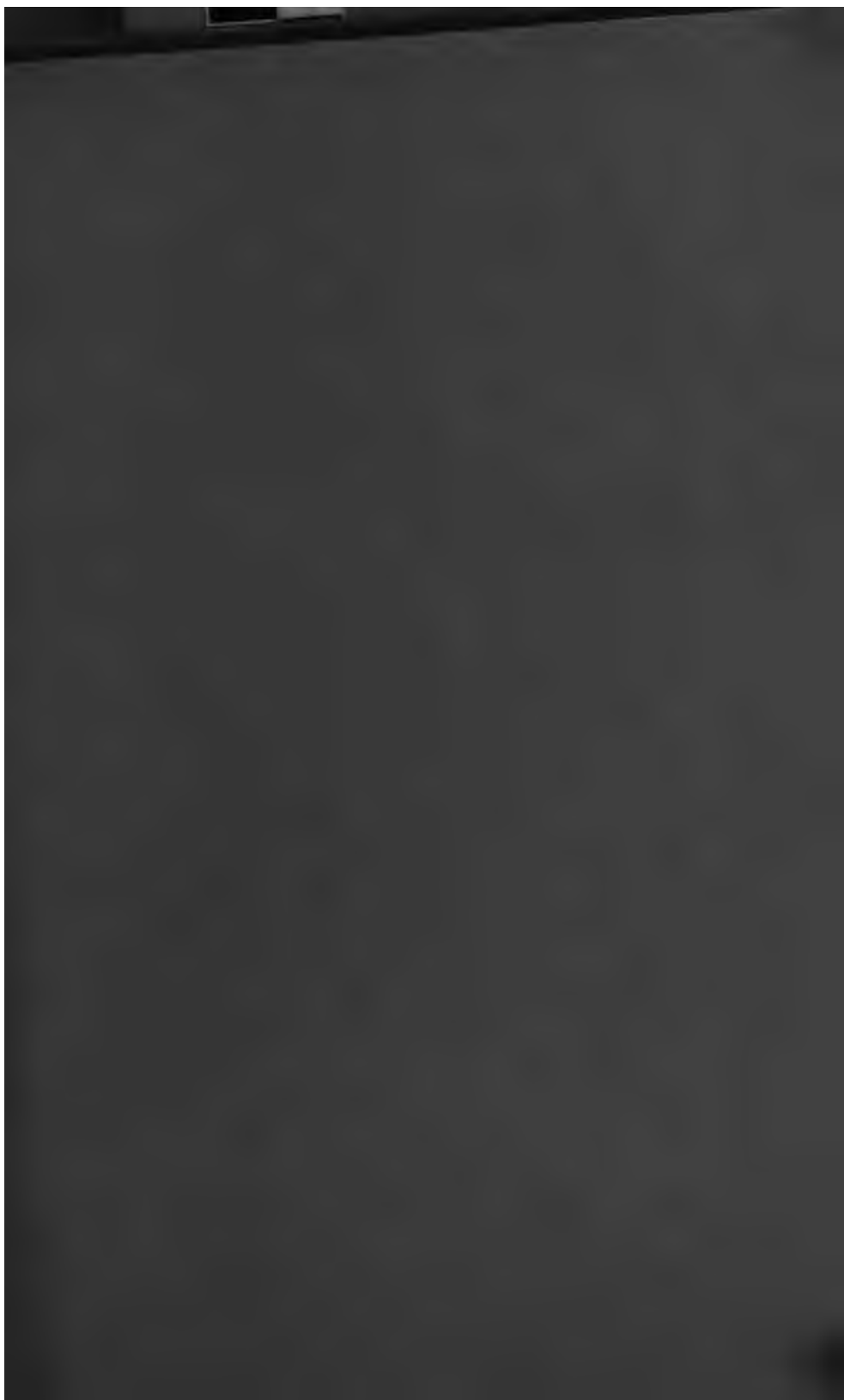
President Page, in a few well chosen remarks, thanked the Association for the honor and, among other things, said:

"Gentlemen, I know a great many of you attribute the credit for the success of our organization to me, but I wish to say that the credit for our success is due, in my judgment, first and foremost, to Mr. Pennybacker and Mr. Light. I have never known two men who have worked harder and on a higher plane than our secretary and field secretary. Their work has been indefatigable. They have received many enticing offers to go with other organizations, but they have stuck steadfastly to our work and I hope somebody will make a motion for a vote of thanks to them. . . . Now, I like to hear good roads addresses but I have hardly been able to stay up in the convention hall because I have learned so much in going around through the splendid exhibits, and I think it is a most liberal education, to a person interested in road work. I hope, gentlemen, that next year, wherever we meet, we shall have an even greater success, if possible, than we have met with this year. I wish very heartily to thank you for the honor you have shown me in electing me president, and I hope that I may be worthy of your trust and confidence. I thank you."

Mr. Kenyon moved that a vote of thanks be tendered to the officers of the Association for the good work which they had done. This motion, duly seconded, was unanimously carried.

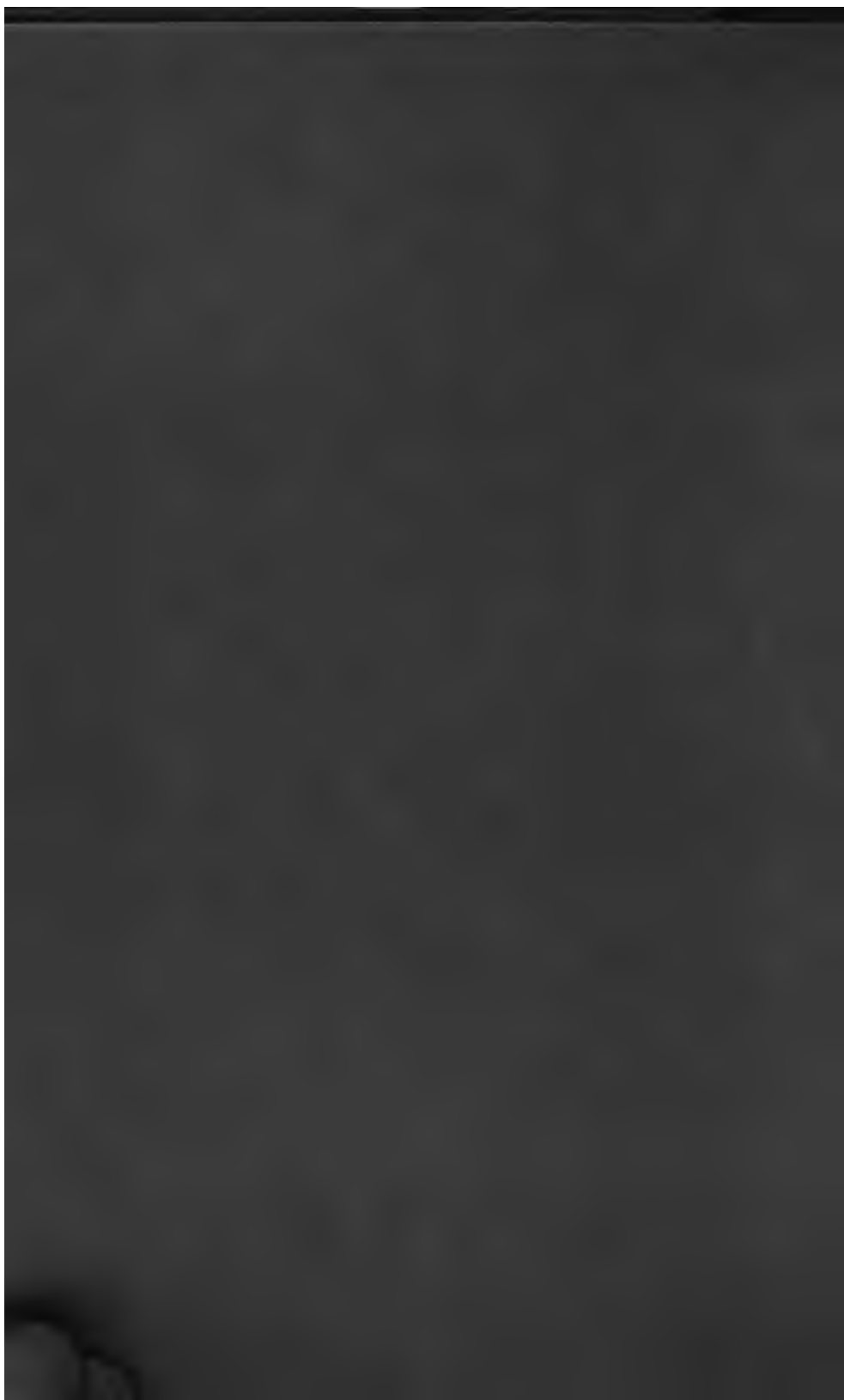
Colonel Washington made a few remarks, stating that he had attended the Third International Road Congress in London and that the exhibition at this Congress exceeded, by 50 per cent if not 100 per cent, in the number of exhibitors, in the variety of exhibits and in the interesting character of the exhibits, notwithstanding that the exhibits shown at the International Exhibit, were participated in by thirty-two nations and held in London, where Germany, France, Italy and all the continental countries had a very excellent opportunity to participate: that this Congress had taken up many more subjects with much broader discussions.

There being no further business, the meeting, upon motion, duly seconded, was adjourned, sine die.

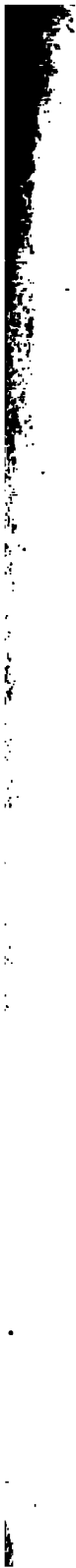






















BB 25 182

